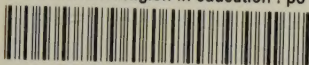


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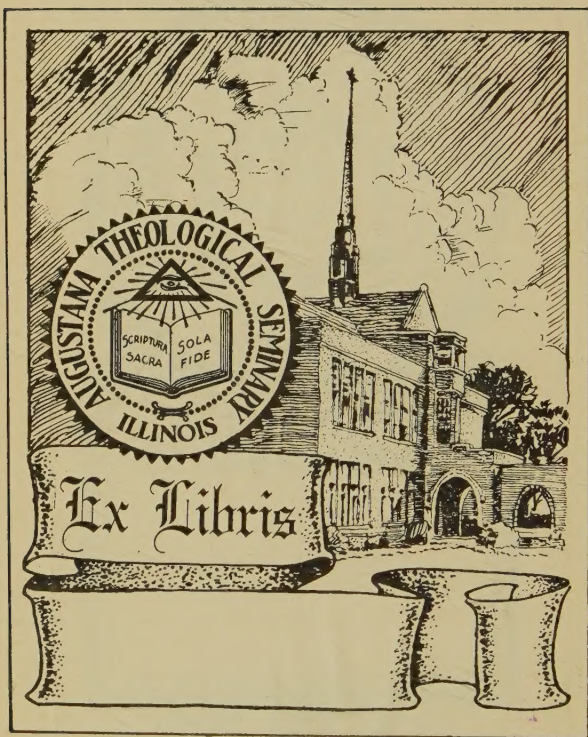
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Evolution and religion in education : po



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BY HENRY FAIRFIELD OSBORN

EVOLUTION AND RELIGION

MAMMALIAN MOLAR TEETH

AGE OF MAMMALS

THE ORIGIN AND EVOLUTION OF LIFE

MEN OF THE OLD STONE AGE

HUXLEY AND EDUCATION

NEW ORDER OF SAINTHOOD

FROM THE GREEKS TO DARWIN

CHARLES SCRIBNER'S SONS

EVOLUTION AND
RELIGION IN EDUCATION

VOLUME III OF COLLECTED ADDRESSES AND ESSAYS

EVOLUTION AND RELIGION IN EDUCATION

POLEMICS OF THE
FUNDAMENTALIST CONTROVERSY OF 1922 TO 1926

BY
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CHARLES SCRIBNER'S SONS
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SEMINARY

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TO
JOHN THOMAS SCOPES
AND
OTHER COURAGEOUS TEACHERS
OF THE UNITED STATES
WHO ELECT TO FACE SQUARELY THE ISSUE THAT
THE YOUTH OF AMERICA SHOULD BE
FREELY TAUGHT THE TRUTH OF EVOLUTION AND THE FACT
THAT THIS GREAT LAW OF LIVING NATURE IS
CONSISTENT WITH THE HIGHEST IDEALS
OF RELIGION AND CONDUCT

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PREFACE

I chiefly owe to my illustrious teacher, Thomas Henry Huxley, the conviction that devotion to pure scientific research and fellowship with the scientific fraternity do not release one from his duty to his less fortunate fellow-men and to the community in which he lives. I also share Huxley's feeling that it is one of the duties and privileges of citizenship to contribute what we can from our own general field of research to the scientific enlightenment of our day and generation.

The present volume includes a series of addresses, some of which were dictated very rapidly to meet emergencies and were published in the controversial columns of the *New York Times* and the *Forum*, others having been delivered on the spur of the moment, in many instances extemporaneously, to college and university students and teachers, and taken down in shorthand. Consequently, the style is not that of the deliberate and finished

essay but, rather, that of the spontaneous expression of convictions drawn from lifelong experience and knowledge and voiced in the language familiar to one's audience. My audiences were mostly student assemblies at Columbia and Cornell Universities, teachers' conventions, and the National Republican Club.

To this volume is added a bibliography of the addresses and essays of the chief participants, on both sides, in the famous evolution and religion controversy of 1922-26.

HENRY FAIRFIELD OSBORN.

COLUMBIA UNIVERSITY,
June 1, 1926.

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ACKNOWLEDGMENT

EVOLUTION AND RELIGION was published in the *New York Times* of March 5, 1922, in reply to an article by William Jennings Bryan; the *Times* also featured THE CASE FOR HUMAN EVOLUTION IN 1925, in its issue of July 12, 1925, and A NEW BASIS OF CREATIVE EVOLUTION in its issue of April 18, 1926. Four of the chapters appeared in the *Forum*, as follows: EVOLUTION AND DAILY LIVING, February, 1925; THE CREDO OF A NATURALIST, April, 1925; THE EARTH SPEAKS TO BRYAN, June, 1925; CONVINCING EVIDENCE OF THE GEOLOGIC ANTIQUITY OF MAN, June, 1926. The first three of these, with the addition of Chapters II and VI, were hurriedly brought out in book form as THE EARTH SPEAKS TO BRYAN by Charles Scribner's Sons in June, 1925, in connection with the Tennessee evolution case. Chapter VIII, HOW TO TEACH EVOLUTION IN THE SCHOOLS, was an address before the Science Section of the Association of Colleges and Secondary Schools of the Middle States and Maryland, at Columbia University, on November 28, 1925, and was printed in *School and Society*, January 9, 1926; in its present form the address was delivered to the Schoolmasters' Association of New York and Vicinity on March 19, 1926, at the Harvard Club, and was printed by them for distribution to their entire membership. Chapter IX was published in *Christian Work*, February 27, 1926.

I

CROSSING SWORDS WITH THE
FUNDAMENTALISTS

The present volume, which comprises the cycle of the three years' disputation, 1922-1925, with Bryan and other fundamentalists, may be introduced by reciting a few of the events which led to the writing of this series of polemic articles, by sketches of the personalities and motives involved, by a few contrasts between our notions of revolution and of evolution, and, finally, by the meaning a naturalist may attach to the words "evolution" and "religion."

CROSSING SWORDS WITH THE FUNDAMENTALISTS

Evolution in court — Cromwell and Darwin — Restoration and revival — Milton, Paley, and Darwin — Nature and the naturalists — Religion and the naturalist — Spiritual versus mechanistic forces.

EARLY in the year 1922 I was suddenly aroused from my reposeful researches in palæontology by an article in the *New York Times* of February 26, by William Jennings Bryan, entitled "God and Evolution." The force of the article lay in his clever citation of the wide differences of opinion existing among evolutionists as to the *causes* of evolution, and especially his citation of the hopeless attitude of the distinguished Cambridge evolutionist, William Bateson, who had recently declared that we know nothing about the causes of the origin of species, although our faith in evolution is unshaken. It struck me immediately that Bryan's article was far more able and convincing than any previous utterance of his or of any other fundamentalist, and that there

4 EVOLUTION AND RELIGION

should be not a moment's delay in replying to it.

Thus began a newspaper and magazine war, a running debate with my distinguished opponent and others, always conducted on both sides with absolute courtesy and good feeling. At the moment of the sudden and regrettable death of the Great Commoner I was pleased to recall that I had never said anything harsh of him in this controversy, and that his final attack on my supposed utter ignorance as to the evolution of man, published in the *Forum* in July, 1925, was good-natured from beginning to end.

EVOLUTION IN COURT

As the peak of our controversy, there occurred in 1925 the Scopes trial. If I have any inclination above all others it is for the truthful education of the youth of America. The fundamentalist movement had not previously given me a moment's thought or concern, but when it began thus to interfere with the teachings in our schools and colleges, to deceive the youth of our country, our boys and girls, our

young men and women in the formative stage, on whose right thinking and right conduct the whole future of America depends, I was thoroughly aroused. Naturally a peace-loving man, in a question of truth I am prepared to fight to the limit. Perhaps I am like the Quaker who, confronted by a pirate attempting to board his ship, gently remarked: "Friend, if thee do insist on boarding my ship I will run thee through the body with my pike." Hence, I was among the first to take up the pike in the Dayton case, because the fundamentalists were trying to board my ship! I was immediately satisfied in my first brief interview with the young Tennessee teacher, John Thomas Scopes, and his proponent, Doctor George W. Rappelyea, that young Scopes risked his position because he was not willing to dissemble. A simple, natural, unaffected youth disclaiming any particular knowledge of biology or evolution, he nevertheless was animated by a great educational principle and agreed with his courageous friend and adviser, Rappelyea, to bring the matter to a test.

Thus these two young Tennesseans started a movement which vibrated around the entire world and which, it is interesting to know, became the subject of serious study and investigation by two of the learned academies of Europe, as I learned from inquiries addressed to me from French and Italian academies of science. As soon as I was convinced of this sincerity I engaged in this struggle for truthfulness in education with all my power. For a time I dropped everything else; I conferred with all the learned counsel—Judge John B. Neal, of Tennessee, Messrs. Bainbridge Colby and Dudley Field Malone, of New York, and Clarence Darrow, of Chicago; I helped the movement toward Dayton of the best biological thought of America, and, although prevented myself from attending the trial, kept in close touch with the splendid body of biologists and geologists who at great personal sacrifice went to Dayton and rendered a noble service for education. I hurried into press a small volume of newspaper and magazine articles entitled “The Earth Speaks to Bryan,” on the real significance of the word “evolu-

tion" in relation to "religion," a volume which was presented to counsel on both sides in the famous Scopes case, also to the editors of all the newspapers of Tennessee. I also hurried to Dayton a thousand copies of my first reply to Bryan, and at the request of the *New York Times* I prepared within a few hours' notice an article, "Osborn States the Case for Evolution" (Chapter VII of this volume), for their issue of July 12, 1925.

CROMWELL AND DARWIN

Revolution destroys the good with the bad. Evolution destroys the bad and favors the good. Revolution occurs again and again in the mind and heart of man. Evolution begins and ends the purposes of God.

When Oliver Cromwell swept over England and Ireland, while attempting to replace the moral code of a decadent court and a hardly less decadent church, he destroyed much that was true and beautiful in the religion of Britain. Thus it is with all revolutions: there is a latent anarchistic element—anarchy in the sense of the destruction of leadership, of con-

ventions and manners, of codes and customs in all forms. It is true that out of the Cromwellian and Puritanic era in Britain there emerged a new and lofty code of conduct, new conceptions of the relation of man to God, and new or restored reliance on the Bible.

The weakness of Puritanism was its lack of symmetry and proportion, its denial of the beauty and joy of living, its independence of Nature, its overreliance on a daily miracle-working God. Moreover, the literalism of Cromwell and of Puritanism extended into the naturalistic field of thought now comprised within our great sciences of Geology, Palæontology, and Biology. Spontaneous thought and observation in all these branches were fairly stifled with Biblical literalism. The Psalmist's broad sweeping aspect of Nature in all its grandeur, the immensity of geologic time, the wisdom of the stars and the parables taught in all forms of animal and plant life were forgotten in textual adherence to the first chapter of Genesis. In our scientific day it is almost inconceivable that even some of

the great scientific minds of England, like those of Sedgwick in geology, of Buckland in palæontology, and of Owen in comparative anatomy, were obliged by this literalism to ignore discoveries in the prehistory of man, to become evasive and insincere, to crib, cabin, and confine their thought, to compress their whole conception of the earth's history within the confines set by the books of Moses, and even by the chronology of Archbishop Ussher.

Charles Darwin's great revolution of 1859, brought about not by fire and the sword nor by a conquering army, but by observant, Quaker-like, and peaceable methods of thought, was far more profound and far more extended than that of Oliver Cromwell. Whereas Cromwell subdued Britain, Darwin invaded the whole world of thought; he turned everything upside down; he destroyed hundreds of old conventions and traditions; he unseated the kings and princes of science and unfrocked the bishops and prelates of theology. In substituting the direct observation of Nature and the true inductive methods for the false deductive methods of reasoning,

Darwin also undermined much that was good and true and beautiful in the religious and spiritual side of life. There is no denying that Darwin and his disciples, in establishing Evolution as a great principle of Nature, also undermined the older foundations of religious thought and action. Only a few prophets of the future like Charles Kingsley were sagacious enough to foresee the consequences which would inevitably ensue if theology arrayed itself against science, if religion arrayed itself against Nature. In the long run science was bound to win, because it had "the big guns" of Nature on its side.

RESTORATION AND REVIVAL

Time softens all errors in the revolutions led by men; it enforces new truths and reinforces the old truths temporarily hidden in the dust and clouds of battle. Our broadening and deepening knowledge of Nature proves that every revolution by its very momentum goes too far and ends in a restoration of the old reverence for moral and spiritual values. A long period of reaction is required

before new and wholesome anti-revolutionary forces are sufficiently strong to restore normal equilibrium between what we know and what we do not know, and never shall know regarding Nature and the forces which lie beyond it—the finite and the infinite.

It may be said that the entire world of thought and of conduct has gone through this long period of readjustment, and that there is in many minds and hearts a renaissance of the older ideals, standards, and philosophies of life and of the older faiths, in new forms and semblances. This revival is touched upon in the fourth of these essays, "The Credo of a Naturalist," in which it is shown that the new movement is not seeking a return to the old moorings but is steering a course entirely its own, in which the truths of Nature no longer conflict with the impulses of religion.

Possibly because of profound religious emotions aroused by the World War, this reactionary spiritual movement among scientific men was coincident in time with the revival of literalism among those leaders of religious

thought who in this country are known as fundamentalists. Both in its origin and in its purposes, the movement among scientific men toward more spiritual conceptions was as remote as possible from that of the fundamentalists. It sought to create a religious attitude toward Nature and toward God not inconsistent with our reason or with the teachings of Nature. The fundamentalist movement, on the other hand, sought to re-establish the Biblical literalism of the time of Cromwell, Milton, and the Puritans which had been totally routed during the nineteenth century.

MILTON, PALEY, AND DARWIN

> The crucial alternative was whether man with all his attributes was created gradually or instantaneously; neither alternative was inconsistent with Design. In his "Natural Theology," William Paley (1743-1805), English divine and philosopher, adapted with consummate skill the argument for the Special Creation of man which the zoologists and natural philosophers Ray (1691), Derham (1711), and Nieuwentyt (1730) had already made familiar:

*"For my part, I take my stand in human anatomy" and insist upon "the necessity, in each particular case, of an intelligent designing mind for the contriving and determining of the forms which organised bodies bear."*¹ [Italics my own.]

It has long been taken for granted by both naturalists and natural philosophers like William James that Darwin's Natural Selection deprived Paley's argument of its force, but in the final chapter of the present volume, "A New Basis of Creative Evolution," it is pointed out that William Paley's argument for Design is no less forceful than it was in 1802, although we must substitute the design of creative evolution for that of instantaneous creation. It is interesting to note that Paley in his day was regarded as a latitudinarian or modernist and that his immortal work, popularly known as Paley's "Evidences," was written in the hope of restoring his regular standing in the Church.

We may not attempt to define either of the words "evolution" or "religion," which are

¹ "Natural Theology," William Paley. Citation¹ from "Encyclopædia Britannica, Eleventh Edition," vol. XX, p. 629.

used today in a hundred different senses; we may use them only as they come within the vision of a naturalist. In the vision of a naturalist and of a lifelong student of prehistoric man from his most remote beginnings and of uncivilized man as we may still observe him in many parts of the world today, the idea of religion is something quite different from the idea bred in the mind of the fundamentalist, who still regards man as a perfectly finished product instantaneously created on the sixth day in the image of God, as nobly phrased by Milton:

. . . The Fiend

Saw undelighted all delight, all kind
 Of living creatures, new to sight and strange.
 Two of far nobler shape, erect and tall,
 God-like erect, with native honour clad
 In naked majesty, seemed lords of all,
 And worthy seemed; for in their looks divine
 The image of their glorious Maker shone,
 Truth, wisdom, sanctitude severe and pure—
 Severe, but in true filial freedom placed,
 Whence true authority in men: though both
 Not equal, as their sex not equal seemed;
 For contemplation he and valour formed,
 For softness she and sweet attractive grace;
 He for God only, she for God in him.¹

¹ "Paradise Lost," John Milton, *Everyman's Library*, p. 80.

In the mind of the naturalist religion, as distinguished from theology, is subjective; it is the soul and spirit of man in relation to Nature and to God. As distinguished from ethics, religion guides the impulses to human conduct in harmony with the character and will of God and with the laws of Nature. In this sense reverence for Nature is in harmony with reverence for God. In this sense also we may read the Psalms in much the same spirit in which we may read the Nature aphorisms of Goethe, 1783, as expressed in the English of Huxley, 1869.¹

NATURE AND THE NATURALISTS

Nature, in the language of Goethe, has the same all-embracing power and infinite personality as is attributed to God in the language of the Psalms. In brief, we might place side by side certain of the aphorisms of Goethe and certain of the Psalms.

Nature! We are surrounded and embraced by her: powerless to separate ourselves from her, and powerless to penetrate beyond her.

She is ever shaping new forms: what is, has never yet

¹ "Nature: Aphorisms by Goethe," T. H. Huxley, *Nature*, November 4, 1869.

been; what has been, comes not again. Everything is new, and yet nought but the old.

Her life is in her children; but where is the mother? She is the only artist; working-up the most uniform material into utter opposites; arriving, without a trace of effort, at perfection, at the most exact precision, though always veiled under a certain softness.

Incessant life, development, and movement are in her, but she advances not. She changes for ever and ever, and rests not a moment. Quietude is inconceivable to her, and she has laid her curse upon rest. She is firm. Her steps are measured, her exceptions rare, her laws unchangeable.

She has always thought and always thinks; though not as a man, but as Nature. She broods over an all-comprehending idea, which no searching can find out.

Mankind dwell in her and she in them. With all men she plays a game for love, and rejoices the more they win. With many, her moves are so hidden, that the game is over before they know it.

She wraps man in darkness, and makes him for ever long for light. She creates him dependent upon the earth, dull and heavy; and yet is always shaking him until he attempts to soar above it.

We obey her laws even when we rebel against them; we work with her even when we desire to work against her.

She has neither language nor discourse; but she creates tongues and hearts, by which she feels and speaks.

She is an eternal present. Past and future are unknown to her. The present is her eternity. She is beneficent. I praise her and all her works. She is silent and wise.

Goethe's aphorisms may be compared line for line with certain verses in the Book of Job. The poet Goethe, like the poet-author of the Book of Job, is unable to avoid the sense of an

omnipresent and beneficent Design in Nature, that of an infinite Personality.

From the naturalist's standpoint also, religion is embraced in evolution as a universally dominant element in the ascending moral and spiritual progress of man. As Schleiermacher, Pascal, and Paley conceived religion, it springs first of all from a sense of dependence, of powerlessness in our contest with the forces of Nature. William James observes that "the religious phenomenon has shown itself to consist everywhere, and in all its stages, in the consciousness which individuals have of an intercourse between themselves and higher powers with which they feel themselves to be related. This intercourse is realized at the time as being both active and mutual. . . . The gods believed in—whether by crude savages or by men disciplined intellectually—agree with each in recognizing personal calls. . . . To coerce the spiritual powers, or to square them and get them on our side, was, during enormous tracts of time, the one great object in our dealings with the natural world."¹

¹ "The Varieties of Religious Experience," William James.

RELIGION AND THE NATURALIST

It follows that the naturalist may regard religion from this detached and dispassionate point of view as an essential and ennobling element in the rise of man, as an element without which man ceases to be man and becomes an automaton or a mere mechanism. Consequently, on purely scientific grounds we may set forth the religious and spiritual life of man as part of the great upward movement of creative evolution.

A philosophic expression of the relation between science and religion is to be found in the Lowell Lectures of 1925, by Alfred North Whitehead, Fellow of Trinity College in the University of Cambridge and Professor of Philosophy in Harvard University:¹

. . . Science is concerned with the general conditions which are observed to regulate physical phenomena; whereas religion is wholly wrapped up in the contemplation of moral and æsthetic values. On the one side there is the law of gravitation, and on the other the contemplation of the beauty of holiness. . . .

¹ "Science and the Modern World," Alfred North Whitehead, pp. 260, 262, 265, 270, 273, 275, and 276.

When we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them. . . .

Science is even more changeable than theology. No man of science could subscribe without qualification to Galileo's beliefs, or to Newton's beliefs, or to all his own scientific beliefs of ten years ago.

Religion will not regain its old power until it can face change in the same spirit as does science. Its principles may be eternal, but the expression of those principles requires continual development. . . .

So far, my point has been this: that religion is the expression of one type of fundamental experiences of mankind: that religious thought develops into an increasing accuracy of expression, disengaged from adventitious imagery: that the interaction between religion and science is one great factor in promoting this development.

. . . I must now state, in all diffidence, what I conceive to be the essential character of the religious spirit. Religion is the vision of something which stands beyond, behind, and within, the passing flux of immediate things; something which is real, and yet waiting to be realised; something which is a remote possibility, and yet the greatest of present facts; something that gives meaning to all that passes, and yet eludes apprehension; something whose possession is the final good, and

yet is beyond all reach; something which is the ultimate ideal, and the hopeless quest. . . . Religion has emerged into human experience mixed with the crudest fancies of barbaric imagination. Gradually, slowly, steadily the vision recurs in history under nobler form and with clearer expression.

. . . The power of God is the worship He inspires. That religion is strong which in its ritual and its modes of thought evokes an apprehension of the commanding vision. The worship of God is not a rule of safety—it is an adventure of the spirit, a flight after the unattainable. The death of religion comes with the repression of the high hope of adventure.

SPIRITUAL VERSUS MECHANISTIC FORCES

A patriotic national plea for the revival of spiritual forces in the modern mechanistic life of Germany is that of Walter Rathenau quoted in the chapter, "The Credo of a Naturalist." A characteristically practical and no less patriotic plea is that of our own President, Calvin Coolidge, in his address at the Annual Convention of the American Red Cross in Washington, September 24, 1923:

A contemplation of these principles and the works which they have wrought, both in our

country and among the other nations, for this spirit is world-wide, is helpful and reassuring. They are among the convincing evidences that justify our faith in mankind. They reveal the fundamental strength of civilization. They demonstrate the supremacy of the spiritual life.

Here we behold the race struggling up through barbarism, overcoming ignorance, establishing order, instituting government, painfully working out their own destiny under free institutions, acknowledging and accepting the truths of religion, gradually casting aside selfishness, endowing the great charities which heal the body, inform the mind, and minister to the soul, making on every hand unending sacrifices that the truth may be supreme. Such is the strength of the influence, of which this organization is one of the representatives. It is inconceivable that it could have come thus far only to retreat, that it could have succeeded up to the present time only to fail.¹

In a subsequent address to the delegates of the Boy Scouts of America, Calvin Coolidge voiced the sentiments which also run through my addresses, "How to Teach Evolution in the Schools" and "How to Restore Religion to the Schools." His words are:

There was no Boy Scout organization in my boyhood; but every boy who has the privilege of

¹ "The Mind of the President," C. Bascom Slemp, pp. 257, 258.

growing up on a farm learns instinctively the three fundamentals of scout-hood.

The first is *a reverence for Nature*. Boys should never lose their love of the fields and the streams, the mountains and the plains, the open places and the forests. That love will be a priceless possession as your years lengthen out. . . .

The second is *a reverence for law*. I remember the town meetings of my boyhood, when the citizens of our little town met to levy taxes on themselves and to choose from their own number those who should be their officers. There is something in every such meeting, in every election, that approaches very near to the sublime. . . .

The third is *a reverence for God*. It is hard to see how a great man can be an atheist. Without the sustaining influence of faith in a divine power we could have little faith in ourselves. We need to feel that behind us are Intelligence and Love. [Italics my own.] ¹

The patriotism of Walter Rathenau and of Calvin Coolidge is of the same order as that which impelled me to cross swords with the fundamentalists, for from the beginning to the end of the three-year period of disputation my chief appeal is to the minds and hearts of the youth of America.

¹ "The Mind of the President," C. Bascom Slempp, pp. 302, 303.

The penetrating reader will observe that these disputatious essays and addresses are in no way to be considered as an exposition or defense of evolution. Why seek to defend a well-established law of Nature? Rather, they constitute a defense of religion against the attacks of those who would make religion the consort of ignorance instead of learning. We may be fairly sure that we are on the right side of civilization and of human progress if we are on the spiritually constructive side, the side which alone attracts and inspires the rising generation. <

II
EVOLUTION AND RELIGION

William Jennings Bryan opened the controversy with an article, "God and Evolution," of very great ability, in which he sought to convince his readers of his utmost readiness to accept the theory of human evolution if there were any substantial proof of it. This apparently disingenuous attitude is summed up in his sentence which Osborn took as a text for the article opening this series and for a subsequent essay, "The Earth Speaks to Bryan," where it is quoted in full.

EVOLUTION AND RELIGION

Bryan's sincerity — The attitude of Kingsley and of McCosh — Evolution a firmly established truth — Augustine leaves Nature to the naturalists — Augustine's modern theistic conception of evolution — Convincing evidence of human evolution.

I APPRECIATE the invitation of the *New York Times* to present the state of our knowledge today regarding Darwinism and the evolution of man, especially in relation to religion, the Bible, and the all-important question of the moral education of our youth. Thousands of good people throughout this country who love the Bible of their fathers and are full of religious faith have been deeply affected by the eloquent and sincere addresses which the Great Commoner has been delivering. Large audiences have listened to him in all parts of the Union with deep interest, and on the members of the Kentucky legislature he made so profound an impression that this body by only a very narrow vote missed the exclusion of evolutionary teaching in all the schools of the State.

BRYAN'S SINCERITY

As evidence of Mr. Bryan's sincerity, I have purposely extracted the sentence which I consider the crux of his whole address, namely: "The real question is, Did God use evolution as His plan? If it could be shown that man, instead of being made in the image of God, is a development of beasts we would have to accept it, regardless of its effect, for truth is truth and must prevail." I interpret this sentence as meaning that he is open to conviction, even if convinced against his will. I am deeply impressed with the fact that he has familiarized himself with many of the debatable points in Darwin's opinions, such as the theory of Sexual Selection, and it is not at all surprising, not being a specialist in biology, that he is extremely confused—as, in fact, many evolutionists are—by the radical differences of opinion as to the power of Natural Selection itself expressed by recent writers such as John Burroughs and Professor Bateson. If it is difficult for biologists to think straight on this very intricate subject of evolution, how much more

difficult must it be for the layman? I have elsewhere shown in a recent number of *Science* that Bateson is living the life of a scientific specialist, out of the main current of biological discovery, and that his opinion that we have failed to discover the origin of species is valueless and directly contrary to the truth.

I have not yet had time to answer John Burroughs's wholly misleading article on "Natural Selection," but I would like to state positively, as a result of twenty-one years of a single research for the United States Geological Survey, that in my opinion Natural Selection is the only cause of evolution which has thus far been discovered and demonstrated. I believe there are many other causes which remain to be discovered. Mr. Bryan, who is an experienced politician, and who has known politicians to disagree, should not be surprised or misled when naturalists disagree in matters of opinion. No living naturalist, however, so far as I know, differs as to the immutable truth of evolution in the sense of the continuous fitness of plants and animals to their environment, and the ascent of all the

extinct and existing forms of life, including man, from an original and single cellular state.

There are two aspects of Mr. Bryan's address: One, religious and philosophical, on which I may first comment, the other, natural, or coming within the field of direct observation, namely, the origin of species and the origin of man. The former affects our religious beliefs or ideas of God and His relation to Nature; the latter is simply a matter of direct observation of the testimony of the earth; the former will always be debatable and largely a matter of personal faith or of scepticism; the latter is a matter of the laboratory, of the field naturalist, of indefatigable digging in all parts of the world among the ancient archives of the earth's history. If Mr. Bryan, with an open heart and mind, would drop all his books and all the disputations among the doctors and study first-hand the simple archives of Nature, all his doubts would disappear; he would not lose his religion; *he would become an evolutionist.*

THE ATTITUDE OF KINGSLEY AND OF McCOSH

“Truth is truth and must prevail”; these words of Bryan constitute the solid rock on which enduring religion and the only enduring knowledge of Nature rest, while the shifting sands of human opinion are swept hither and thither both in theology and in science. Wrecked on these sands of opinion are many great names, both in theology and in science, but fortunately there have lived some wise pilots of Nature who would have kept our thinking straight if we had heeded their counsel. I had the good fortune to fall under the influence of James McCosh, natural philosopher and divine, who in his lectures on “Christianity and Positivism” accepted evolution, with most of its implications, in the year 1876.

Thirteen years earlier, in 1863, Charles Kingsley, whose religion no one has ever challenged, struck the note of truth only four years after Darwin’s “Origin of Species” appeared, when he wrote to Frederick Maurice, one of the most profoundly religious men that Eng-

land has produced: "Darwin is conquering everywhere, and rushing in like a flood, by the mere force of truth and fact. The one or two who hold out [against Darwin] are forced to try all sorts of subterfuges as to fact, or else by evoking the *odium theologicum*." In the same letter Kingsley says: "The state of the scientific mind is most curious; . . . they find that now they have got rid of an interfering God—a master-magician, as I call it—they have to choose between the absolute empire of accident, and a living, immanent, ever-working God."

Kingsley describes himself as "busy working out points of natural theology, by the strange light of Huxley, Darwin, and Lyell. I think I shall come to something worth having before I have done."

EVOLUTION A FIRMLY ESTABLISHED TRUTH

Although in the van of the religious thinkers of his time, Kingsley was not in a position to answer Mr. Bryan's main question: "Did God use evolution as His plan?" Evolution

in 1863 rested on the indirect or circumstantial evidence presented by Darwin, while in 1922 it *is the most firmly established truth in the natural universe* and, in Mr. Bryan's language, we shall have to accept it regardless of its effect. Let us, therefore, glance at some of the effects.

I am not writing to convince evolutionists, I am writing to convince Mr. Bryan himself and his many followers. That you may avoid all religious doubts and difficulties, first accept as the foundation of your faith the creed which runs through the Old and New Testaments alike and is best expressed in the grand old Latin phrase, "Pleni sunt cœli et terra gloria tua." Without this creed, you may be an atheist or an agnostic. With this creed you are in a secure citadel of faith, and when discovery after discovery impels you to surrender the preconceptions of man in his ignorance as to Joshua's belief that the sun moved around the earth, as to the flatness of the earth, as to the universe being formed in six days of twenty-four hours, as to all the millions of species of animals and plants

being made within four days, as to man being made in the image of God in one day, as to woman being made out of the rib of man, you remain serene, because you humbly accept the universe and man as God willed them. You may be convinced that your misgivings and prejudices against Nature will all be resolved, if you simply repeat to yourself: I accept Nature as God made it; truth is truth and must prevail.

Nothing should be more clearly or more emphatically taught to our youth than that the Bible is the story of the spiritual and moral progress of man, in less degree his intellectual progress—in these senses a perpetual source of inspiration, of religious consolation, and the most permanent foundation of conduct. We naturalists accept as transcendent the teaching that the universe is by no means the result of accident or chance, but of an omnipresent beauty and order, attributed in the Old Testament to Jehovah, in our language to God. Evolution by no means takes God out of the universe, as Mr. Bryan supposes, but it greatly increases the wonder, the mys-

tery, and the marvelous order which we call "Natural Law," pervading all Nature.

No child should be taught that the Bible tells the story of Nature as it has been revealed to us through two thousand years of observation, and especially during the last one hundred years. There was no curiosity about Nature among the writers of the Bible, as there is little natural curiosity among Orientals to-day. It was not until the Book of Job was written, about 450 B. C., that we find the guiding precept of the naturalist: "Speak to the earth and it shall teach thee."

AUGUSTINE LEAVES NATURE TO THE NATURALISTS

When Mr. Bryan observes that evolution finds "no support in the Bible," he is absolutely right, just as he is absolutely wrong when he maintains that belief in evolution ends in atheism. On this point I know I shall not convince him if I quote any scientific authority, but I feel that I may direct Mr. Bryan's attention to a writer whom he has evidently not studied; namely, the great the-

ologian of the fifth century, St. Augustine, 354-430 A. D. I may quote St. Augustine as to the wisdom of leaving Nature to the naturalists:

It very often happens that there is some question as to the earth or the sky, or the other elements of this world . . . respecting which one who is not a Christian has knowledge derived from most certain reasoning or observation, and it is very disgraceful and mischievous and of all things to be carefully avoided, that a Christian speaking of such matters as being according to the Christian Scriptures, should be heard by an unbeliever talking such nonsense that the unbeliever perceiving him to be as wide from the mark as east from west, can hardly restrain himself from laughing.

AUGUSTINE'S MODERN THEISTIC CONCEPTION OF EVOLUTION

To Augustine also Mr. Bryan may be referred for a sound and thoroughly modern theistic conception of evolution. Augustine held that all development takes its natural course through the powers imparted to matter by the Creator; even the bodily structure of man himself is according to this plan, and therefore a product of this natural develop-

ment; he taught that in the institution of Nature we should not look for miracles, but for the laws of Nature; he distinctly rejected the Mosaic idea of the six-day creation in favor of the teaching which, without violence to language, we may call a theory of evolution: that all things developed by causal energy and potency, not only the heavens, but also those living things which the waters and the earth produced, so that in due time, after long delays, they developed into their perfected forms.

We may now leave this metaphysical part of the subject and return to the evidence that evolution was the plan and the only plan of Nature, that all species of animals and plants originated in this way, that man has ascended from the ranks of Nature. There was a time when man considered himself greatly superior to the animal kingdom; in fact, the Psalmist exalts him, giving him dominion over the whole earth; but since 1914, when the World War began, man has become more humble, he is not quite so confident of his superiority over the rest of God's creation.

The mode of origin of species was practically

discovered in 1869 by a little-known German palæontologist by the name of Waagen, but, like the great discovery of Mendel in heredity, this truth has been long in making its way, even among biologists. Waagen's observation that species do not originate by chance or by accident, as Darwin at one time supposed, but through a continuous and well-ordered process, has since been confirmed by an overwhelming volume of testimony, so that we are now able to assemble and place in order line after line of animals in their true evolutionary succession, extending, in the case of what I have called the edition de luxe of the horses, over millions of years.

We speak to the earth from Eocene times onward to the closing age of man, and it always teaches us exactly the same story. These facts are so well known and make up such an array of evidence that they form the chief foundation of the statement that evolution has long since passed out of the domain of hypothesis and theory, to which Mr. Bryan refers, into the domain of natural law. Evolution takes its place with the gravitation law

of Newton. It should be taught in our schools simply as Nature speaks to us about it, and entirely separated from the opinions, materialistic or theistic, which have clustered about it.

This is my answer to Mr. Bryan's very natural solicitude about the influence of evolution in our schools and colleges—a solicitude not inherent in the subject itself, but in the foolishness and conceit of certain of the teachers who are privileged to teach of the processes of life.

CONVINCING EVIDENCE OF HUMAN EVOLUTION

It would not be true to say that the evolution of man rests upon evidence as complete as that of the horse, for example, because we have traced man's ancestors back only for a period of 400,000 years, as geologic time was conservatively estimated in 1893 by Secretary Walcott of the Smithsonian Institution, Washington; whereas, we have traced the horse back for a period of 3,000,000 years, according to similar estimates of geologic time.

The very recent discovery of Tertiary man which I have just described in *Natural History* (November–December, 1921), living

long before the Ice Age, certainly capable of walking in an erect position, having a hand and a foot fashioned like our own, also a brain of sufficient intelligence to fashion many different kinds of implements, to make a fire, to make flint tools which may have been used for the dressing of hides as clothing, constitutes the most convincing answer to Mr. Bryan's call for more evidence. It once more reminds us of the ignorance of man of the processes of Nature, and sets a new boundary beyond which digging in the earth for more of truth must be directed. This Foxhall man, found near Ipswich, England, thus far known only by the flint implements he made and his fire, is the last bit of evidence in the direction of giving man a descent line of his own far back in geologic time. It tends to remove man still farther from the great lines which led to the man-apes, the chimpanzee, the orang, the gorilla, and the gibbon. This is not guesswork, this is a fact. It is another truth which we shall have to accept regardless of its effect. No naturalist has ever ventured to place man so far back in geologic time as this

actual discovery of the Foxhall man places him. In this instance again truth is stranger than hypothesis or speculation.

Nearer to us is the Piltdown man, found not far from seventy-five miles to the southwest of Ipswich, England; still nearer in geologic time is the Heidelberg man, found on the Neckar River; still nearer is the Neanderthal man, whom we now know all about—his frame, his head form, his industries, his ceremonial burial of the dead, his belief in a future existence; nearer still is the Crô-Magnon man, who lived about 30,000 years ago, our equal if not our superior in intelligence. This chain of human ancestors was totally unknown to Darwin. He could not have even dreamed of such a flood of proof and truth. It is a dramatic circumstance that Darwin had within his reach the head of the Neanderthal man without realizing that it constituted the “missing link” between man and the lower order of creation. All this evidence is to-day within reach of every school-boy. It is at the service of Mr. Bryan. It will, we are convinced, satisfactorily answer

in the negative his question: "Is it not more rational to believe in the creation of man by separate act of God than to believe in evolution without a particle of evidence?"

Let us accept the Bryan dictum: *Truth is truth and must prevail*. Truth is not in our minds; we must seek it in Nature and in Religion and keep on seeking until we find the whole truth and nothing but the truth.

III

EVOLUTION AND DAILY LIVING

This address to the Columbia University Assembly (April 1, 1924) is in reply to the statement that belief in evolution is the offspring of atheism and the chief cause of modern decadence.

This address is not a sermon, unless it be a sermon in stones. All that the old Romans summed up as Virtue in the conduct of life is affected by evolution. Belief in evolution demands the highest ideals in conduct; it bears directly on our daily "mores"—our usages, fashions, customs, and behavior. Belief in evolution and faith in Christianity as a code of conduct are by no means incompatible; one can be both evolutionist and Christian.

EVOLUTION AND DAILY LIVING

The fundamentalists attack evolutionists as atheists — The creed of evolution — A new definition of evolution — The gradual emergence of man's higher powers—Redeeming the reputation of the cave man — The triumph of observation and failure of speculation — The naturalist replaces the materialist — Huxley's reverence for the Bible — Evolution and morals — The press the most potent influence on daily life — Conduct and the future of our race.

EVOLUTION is challenged today by many good and well-meaning people, at once as an enemy of religion, as the cause of the rise of animalism, and as the chief cause of decadence in conduct.

I am informed by the bishop of the Episcopal diocese of Arizona that before a crowded house in Texas William Jennings Bryan recently classed me with Voltaire, Thomas Paine, and Robert Ingersoll as an atheist, because I believe in Evolution. Nearer home, John Roach Straton posted this charge on the front of Calvary Baptist Church: "Is the American Museum of Natural History Mis-

spending the Taxpayers' Money and Poisoning the Minds of the School Children with False and Bestial Theories of Evolution? Should not the Bible be Displayed in the Museum as well as Old Musty Bones?" I immediately sent to Doctor Straton the following letter:

Such a notice is very serious indeed. I am quite mindful of the Scriptural injunction which, as I recall it at the present moment, reads: "Whoso shall offend one of these little ones which believe in me, it were better for him that a millstone were hanged about his neck and that he were drowned in the depth of the sea." The American Museum is visited annually by hundreds of thousands of children, and its lectures are attended altogether by millions of children. No one can point out either in the exhibition halls of the American Museum or in its lectures a single untruthful statement, because the lectures and the exhibition halls do not set forth theories, but what may be actually observed in Nature by an intelligent child, if the opportunity is afforded. If you will examine carefully an exhibit in the Hall of the Age of Man you will see that it demonstrates very clearly not that man has descended from the monkeys or from the apes, but that he has a long and independent line of ascent of his own.

It is not for man to question his Creator, but to accept every act of creation as the Act of God.

If there is in the world anything that I love it is the children, and anything that I reverence it is the beauty of the child soul—the kind of pristine, natural beauty which Wordsworth portrays in his “Ode on Intimations of Immortality.”

I am myself, or endeavor to be, a consistent evolutionist; I also undertake the far more difficult task of being a consistent Christian. I believe in the past evolution of man and in the present evolution of man, and I am hopeful of the future evolution of man, unless his conduct leads to his extinction, as it is now doing in many parts of the world.

THE CREED OF EVOLUTION

As summed up in my rapidly written reply to Bryan's article in the *New York Times* of February 26, 1922, this simple, direct teaching of Nature is full of moral and spiritual force, if we keep the element of human opinion out of it:

The moral principle inherent in evolution is that nothing can be gained in this world without an effort; the ethical principle inherent in evolution is that only the best has the right to survive; the spiritual principle in evolution is the evidence of beauty, of order, and of design in the daily myriad of miracles to which we owe our existence.

A NEW DEFINITION OF EVOLUTION

I have come in my own mind to define evolution as a *continuous creation of life fitted to a continuously changing world*. This definition is made, not from reading the works of other biologists, but from my own close observations on animal and human evolution and through my lifelong researches in palæontology. I believe that not alone our physical but our moral, our intellectual, even our spiritual, powers have ascended through a long, slow, upward movement, which we partially express in the utterly inadequate word *Evolution*; Bergson's term *Creative Evolution* is far nearer the actual truth.

The creative evolution process actually consists of the incessant creation of new forms and combinations of energy in the animal world, of new means of enjoying the rest of the universe both in the animal and in the human world, of new moral, spiritual, and intellectual powers gained sometimes slowly, sometimes suddenly. This is the outstanding result of forty years of my own observation. Evolution as a greater or less development of < the existing powers of a plant or animal is the least difficult part to comprehend; the creation of new powers and faculties, especially of the human mind and spirit, is the most difficult to comprehend—in fact, the incomprehensible part of the whole process.¹

EMERGENCE OF MAN'S HIGHER POWERS

Our knowledge of the physical evolution of man, of his bodily structure, has advanced so rapidly that the end is almost in sight; namely, of the whole Age of Man of the last 500,000 years and of the preceding Tertiary period.

¹ This subject is given fuller treatment in the closing chapter of this volume.

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But the physical structure of man is a relatively simple problem in comparative anatomy and palæontology. It is not his physical anatomy which makes man human; it is his moral, intellectual, and spiritual nature alone that makes him a member of the order *Primates* of the great Swedish naturalist, Linnæus.

So far as we can observe, the foundations of the moral nature of man were apparently laid in the subhuman stages, for certainly three of the cardinal human virtues—such as protection of the family, observance of the rights of others, including the rights of property, and union for collective rights—exist in a very high degree in many of the living primates, and probably existed as well in those as yet entirely unknown primates of the Tertiary period from which we are descended.

REDEEMING THE REPUTATION OF THE CAVE MAN

Regarding the intellectual evolution of man, the case immediately becomes more difficult. I was never so impressed with this

fact as in my journeys among the former habitations of the cavemen in northern Italy, France, and Spain. I soon conceived a great admiration for these men because of their undoubted intellectual powers as observed not only in the superb development of the brain, but also in the high observational and artistic powers manifested in their art. I am perhaps more proud of having helped to redeem the reputation of the cave men than of any other single achievement of mine in the field of anthropology. The cave man bore, and still bears, an evil reputation of being a brute, because few people recognize that during the long cave period there were two entirely different types of man—one of an extremely ancient lower order, known as the Neanderthal race of hunters, suddenly succeeded in Europe by one of much higher order, known as the Crô-Magnon race of artists. The creation of this man of a higher order, with his moral, spiritual, and intellectual powers, is utterly incomprehensible as purely a process of the survival of the fittest. ←

We have every reason to believe that the

men of the Crô-Magnon race who dominated northern Spain, France, and England between twenty-five and forty thousand years ago could compete in the art schools with any of the animal sculptors and painters of our day, and judging from the size and form of the brain of the Crô-Magnon youth I believe that they could enter any branch of the intellectual life of today on equal, if not superior, terms. We know that they were mystical and superstitious and believed in magic, and were, in a primitive sense, religious. We know that in their art they were absolutely truthful and sincere. We know that they were reverent because in the thousands of drawings, etchings, and paintings which they have left not a single irreverent one has been discovered, except in some of their representations of man. We know that they were conscientious because their drawing has the marks of fidelity to truth, to the last detail. We know that they loved beauty because they rapidly attained the full expression of beauty in the representations of animal life.

This emergence of the soul and of the mind

of man prior to the poetry, the art, the literature, the philosophy, and even the science of early civilization is what I refer to as the creative element in evolution. The case of the Crô-Magnons is by no means unique. The men who wrote the epics of Homer had barely emerged from the northern forests. An Eskimo boy brought by Peary from the arctic region, educated by a tribe of primitive people who count only up to the number 5, competes successfully in one of our public schools. Two Peruvian brothers taken directly out of the forests attain high rank in a parochial school. We observe that intelligence dawned slowly in the mind of man,¹ but we cannot observe why a mathematical mind arose before there was any science of numbers.

TRIUMPH OF OBSERVATION; FAILURE OF
SPECULATION

The genesis of the intellectual and spiritual powers of man through the Lamarck-Spencer hypothesis of use and disuse fails as entirely as does the survival of the fittest or any other useful theory of genesis of the mind and of

the soul. All the Lamarckian and purely materialistic hypotheses which were current when I was studying philosophy and biology in 1876 have fallen one by one by the wayside, and the origin of the soul of man is more of a mystery than ever. All we know is that the soul did not originate in an instant of time, as Bryan believes; rather, in the language of Wordsworth,

The Soul that rises with us, our life's star,
Hath had elsewhere its setting,
And cometh from afar.

Every day during my forty-eight years' observation and philosophy of Nature and of the biology of man I become more of a *naturalist*, less of a scientist, still less of a rationalist. What has been the fate of the rationalism of 1876 or of the materialism of that day or of the other "isms" which were held up to our tender student minds as bogies? I remember the catch phrases: as to materialism, for example:

"What is matter?"

"Never mind."

“What is mind?”

“No matter.”

“What is the soul?”

“It is immaterial!”

Or as to the chemical nature of intellect:
“The brain secretes thought as the liver secretes bile.” Or as to the evolution of man—the parody:

There was an ape in days that were earlier,
Centuries passed and his hair became curlier,
Centuries more, and his thumb gave a twist
And he was a Man and a Positivist.

Or the squib on clericalism, Huxley’s saying about the two chambers of the heart, referring to the resemblance of the bicuspid valve to the bishop’s mitre: “We may always remember that the tricuspid valve is on the right side of the heart and the mitral valve on the *left*, because a bishop is never known to be in the right.”

THE NATURALIST REPLACES THE
MATERIALIST

Both scientific and religious men have largely passed out of this critical, polemic,

materialistic and mechanistic period of antagonism between religion and science, and Bryan's rôle is that of the grave-digger of fossil issues and controversies.

The truth is that both sides are far more humble and less cocksure than they were in the '70's. Human reason in the '70's, after having been kept indoors by the theologians for nearly ten centuries, was like a boy out of school—it knew no bounds; it was full of brisk confidence; it did not realize, as human reason does today, that Nature is super-rational. We have all found that Nature is full of lurking surprises and contradictions in her methods. The bishops and clericals have learned that so far from the world being anthropocentric, man seems to have been one of the last things thought of in creation.

No overconfident rationalist of 1876 dreamt of radiant energy as we know it now; no one can dream of biology as it will be fifty years hence when it is studied by physical methods. Rationalists are more humble now, because in the hunting-field of human thought the scientists have taken as many falls as

the theologians; the honors are even in this regard.

HUXLEY'S REVERENCE FOR THE BIBLE

My great teacher Huxley felt the limitations of the human reason in defining himself as an agnostic or as an honest doubter. His system of teaching evolution and morals was diametrically opposed to that of Herbert Spencer, as was also his attitude toward religion and the Bible.

Brought up, as I was, by a devout Christian mother, Huxley retained his love and reverence for the English Bible:

When the great mass of the English people declare that they want to have the children in the elementary schools taught the Bible, and when it is plain from the terms of the Act . . . that it was intended that such Bible-reading should be permitted, unless good cause for prohibiting it could be shown, I do not see what reason there is for opposing that wish. Certainly, I, individually, could with no shadow of consistency oppose the teaching of the children of other people *that which my own children are taught to do*. . . .

I have always been strongly in favour of secular education, in the sense of education without the-

ology; but I must confess I have been no less seriously perplexed to know by what practical measures *the religious feeling, which is the essential basis of conduct*, was to be kept up, in the present utterly chaotic state of opinion on these matters, without the use of the Bible. [*Italics my own.*]

For these reasons I regard Huxley's influence on Conduct as far more lasting than that of Spencer. While in 1879 the works of Herbert Spencer were regarded with reverence and awe and were read by thousands of students like a new revelation of truth, the Herbert Spencer system has crumbled so far as it depended on pure reason, so far as it departed from direct methods of observation. Ernst Haeckel was the great proponent of Darwinism on the Continent of Europe, and the chief elements of his theories of the origin and evolution of man have crumbled like those of Spencer. Darwin as an observer of Nature is still strong and will always be our master; so far as his works were drawn directly from Nature they are truer and more wonderful than ever, while the entirely speculative or rationalistic side of Darwin's philosophy has largely

failed. Huxley, from 1863 until his death in 1895 the boldest proponent of the evolution of man among English-speaking people, was always a very cautious thinker, overcautious in his theories as to the evolution of man.

Huxley never committed himself to the survival-of-the-fittest theory as to the origin of species as adequate, and in his last public utterance, the Romanes Lecture, he declared that we could not derive the moral or spiritual evolution of man from Darwin's hypothesis of the struggle for existence. In this declaration, which has been quoted so often as divorcing evolution from conduct, I do not for a moment agree with my great master of 1879-80. We know far more about the actual evolution process than Huxley did, because in his time the creative element in evolution had not been discovered.

It may be said without scientific or religious prejudice that the world-wide loss of the older religious and Biblical foundation of morals has been one of the chief causes of human decadence in conduct, in literature, and in art. This, however, is partly due to a complete

misunderstanding of creative evolution, which is a process of ascent, not of descent.

EVOLUTION AND MORALS

A challenge to evolution now is a challenge to Nature itself, and Nature is the oldest and wisest instructor of both minds and morals. Cicero observed, "I turn to Nature as I would to God," and this is the underlying thought of modern conceptions of evolution in relation to conduct; great religious thinkers, like St. Augustine, Dante, Charles Kingsley, Ralph Waldo Emerson, have from time to time reminded us of this chief doctrine of Cicero; Kingsley, who followed in the steps of Cicero, St. Augustine, and Dante, declared that there could be no antithesis between the order of Nature and true religion.

"*O tempora, O mores,*" exclaimed Cicero when he was outraged with the conduct of life, and particularly with the political life of Rome; Horace at the same period lamented the loss of the ancient virtues. Times have changed little since 50 B. C. and both man and Nature are exactly the same now as they were then.

Whereas a little knowledge of evolution has proved to be a very dangerous thing in human history, a more profound knowledge of evolution makes it a very safe thing for the present and future progress of the human race. Lest we become too serious, let us refer to the immortal Pickwick. We recall where Sam Weller speaks of the fascination of widows he says: "A little widow is a dangerous thing." I am often reminded of this when I see the first effects of science and of the principle of evolution not only on the student mind, but on the mind of the man of the street and on the mind of the man of letters.

As to Nature's firm foundations for religion and morals in our own day, may I refer to the bearing which the new creative idea of evolution has upon the old teleological argument for Design as set forth in Paley's "Evidences,"¹ the standard text-book of my student days? Huxley once told me that Paley's argument for the direct handiwork of the Creator was so logically, so ingeniously and convincingly written that he always kept it at his bedside

¹ "Natural Theology," William Paley.

for last reading at night. So long as the chance or fortuitous hypothesis of adaptation reigned, Paley's argument for the existence of God was set aside, but our more profound knowledge of creative evolution, gained by direct observation of Nature, leaves Paley's argument just as strong as it ever was. Paley's "Evidences" may be challenged now no more effectively than it could be challenged in 1858.

Bryan and Straton as public mentors endeavor to take the place of Cicero and Horace, without any of their literary genius or truth-loving spirit. They are the demagogues of modern conduct; they tell us that Nature and Evolution are inconsistent with Religion and are undermining Conduct. Let us boldly declare that freedom of thought has led to license of thought and expression; let us lament the disuse of the Bible in its eternal influence on conduct; but let us not for a moment imagine that belief in evolution or any other great truth of Nature releases us from the highest ideals of conduct. Let us rather put every one of the daily practical problems of conduct *to the crucial test of its bearing on human prog-*

ress and on the future of our race and of human society.

What, for example, will be the influence on human progress of our attitude on Religion, on Individualism, on Marriage, on Fashion, on our Intellectual and Spiritual Life, on Government, on Freud's Psychology, on the Stage and the Movies, on Problem Literature, on the daily newspaper? I can prove that each of these current questions and problems bears upon the evolution of our race.

THE MORAL POTENCY OF THE PRESS

As for the press, it may interest my readers to know that I invariably study the daily papers from the standpoint of human evolution, because I hold that the press and the movies are by far the most potent influences upon conduct in America at the present time.

The editorial influence of the press is almost uniformly good so far as domestic morals are concerned. The news-column influence of the press is partly bad but mostly good, because publicity tends on the whole to elevate morals. The advertising pages of the press are

divided in their influence: health advertisements are to the good; feminine-fashion advertisements are mostly to the bad. The sum of press influence is morally good but intellectually bad, because it creates what I call the jazz mind and a disproportionate sense of relative values.

<i>New York:</i>	<i>Fashion</i>	<i>Athletics</i>	<i>Political Misconduct</i>	<i>Politics—Domestic</i>	<i>Stage and Movies</i>
World.....	7,589	8,272	5,757	2,889	2,352
Times.....	29,317	11,850	6,070	9,148	5,027
American..	438	7,103	4,692	1,834	3,294
	37,344	27,225	16,519	13,871	10,673
<i>New York:</i>	<i>Private Misconduct</i>	<i>Politics—Foreign</i>	<i>Education</i>	<i>Food and Health</i>	<i>Religion</i>
World.....	3,531	2,745	1,409	932	1,037
Times.....	2,730	4,774	956	656	1,043
American..	3,613	955	57	692	182
	9,874	8,474	2,422	2,280	2,262

With the aid of the School of Journalism of Columbia University I made a quantity survey of the amount of space devoted by three great newspapers of the day to ten prin-

cial subjects for the month of February, 1924. The measurements are made in linear columns, twenty-one inches to the column, and advertisements are included because advertisements dominate fashions, as shown in the table on the previous page. All of these headlined subjects are related to our daily life and conduct in a manner we may not be conscious of.

It is observed in the above table that the press treats in descending order of importance the following subjects which daily affect our lives: Fashion, Athletics, Political Misconduct, Politics, national and local (*i. e.*, government), the Stage and the Movies, Private Misconduct (crime, etc.), Foreign Politics, Education, Food and Health, Religion.

Small wonder that ours is not a religious age; small wonder that education, which Lincoln regarded as the very first concern in the conduct of the State, is little in our thought; small wonder that the average young American is convinced of prevailing political misconduct; small wonder the craze for athletics. It is a question whether the fine influence on

conduct of the editorial writer is not more than offset by the man who arranges the news and advertising columns.

CONDUCT AND THE FUTURE OF THE RACE

And what is our own attitude on all these daily problems of our life? Is it constructive or creative? Does it tend to human ascent? If our conduct works well now how will it work on our descendants a century hence? Are we living in such a way as to have descendants? This is the very newest aspect of the human-evolution problem, namely, what will be the bearing of the present-day attitude toward daily practical questions of conduct on the future of our race.

It is not immediately obvious, but a moment's reflection shows that our future is inevitably bound by daily practical questions of conduct. For example, we may smile at prohibition, but when we look at it from the standpoint of the future progress of man we become serious; every drinking man I knew in college in 1876 and every drinking student of mine up to the year 1890 has paid the death

penalty, and they were all fine men who could hardly be spared. As the great English physician, Sir Andrew Clark, said to one of his wayward patients: "Nature forgives but never forgets."

It may amuse us to read of individualistic young women abandoning their husbands and their children, but when we Americans learn that as a race we are rapidly dying out our amusement ceases. In this connection let us read the Very Reverend William Ralph Inge, Dean of St. Paul's, called "gloomy" because he has the courage to tell the truth; not really gloomy, he is at once the leading moral and scientific preacher of our times.

I am not gloomy either, but as a consistent evolutionist I desire to see the conduct of the young men and women of America so governed by religion and by Nature that they will evolve in the right direction.

IV

THE CREDO OF A NATURALIST

“The purpose of science is to develop, without prejudice or preconception of any kind, a knowledge of the facts, the laws, and the processes of nature. The even more important task of religion, on the other hand, is to develop the conscience, the ideals, and the aspirations of mankind. Each of these two activities represents a deep and vital function of the soul of man, and both are necessary for the life, the progress, and the happiness of the human race.” (*From a Credo signed by fifteen eminent scientists, May 26, 1923.*)

THE CREDO OF A NATURALIST

The philosophy and psychology of 1876 and of 1926 — Our psychologists lose the soul — Brain physiology replaces the older psychology — Physicists rediscover the soul and the spiritual nature of man — Rudolf Eucken and Walter Rathenau in contrast with Dewey — Harnack and Huxley's pupil Morgan — "Creative" and "emergent" evolution — Physiologists Martin and Haldane on Conduct — The failure of pure mechanism — Wordsworth expresses our credo.

IN 1876, when I began my philosophic and scientific studies in Princeton, the long struggle between Supernaturalism and Naturalism was culminating in a complete victory for Naturalism. In England Mill and Huxley had won the battle for freedom of the human reason; in Germany along with Haeckel's battles for Darwin there had sprung up an extreme form of materialism; in France the mechanistic teaching of Descartes was revived. The pendulum of thought had swung completely away from the teleological or purposive interpretation of Nature that had entirely dominated the natural science of the first half of the century.

The whole rising generation of naturalists dropped the Bible and eagerly read Herbert Spencer, whose philosophy and biology became a new gospel; the successive editions and translations of his works were second only to those of Darwin. Among American students Spencer was still supreme as late as 1891 when I came to Columbia. As for his influence among laymen, I well remember Judge Carter, of Fort Bridger, Wyoming, and his shrine of Spencer's complete writings, encased with a photograph of the great closet philosopher. Now Spencer has become merely an historic figure in the history of natural philosophy; he is no longer a living force.

It would be difficult to fix the date for the return swing of the pendulum away from purely materialistic and mechanistic interpretations toward spiritual and teleological interpretations not in the least resembling the old but pointing toward new forms of belief and of faith in which there is less schism between the teachings of Nature and the aspirations of Religion. The World War certainly accelerated this spiritual movement, because

it engendered a horror of mechanism and materialism and placed a new emphasis upon the spiritual basis of conduct rather than upon the mechanistic. The movement was not led, as might have been expected, by biologists, still less by psychologists.

OUR PSYCHOLOGISTS LOSE THE SOUL

In the recent writings of two of the leading psychologists and philosophers of America, Dewey, of Columbia, and McDougall, of Harvard, it appears that psychologists have lost touch with the soul.¹ Contrasting the older and orthodox psychology with the present, Dewey remarks that "the soul or mind or consciousness was thought of as self-contained and self-enclosed. Now in the career of an individual if it is regarded as complete in itself instincts clearly come before habits. Generalize this individualistic view, and we

¹ As defined in 1894 by the Reverend E. Cobham Brewer, LL.D., the soul has a double significance in its historic and even in its Biblical usage: Soul and Spirit. *ἡ ψυχὴ* (the soul) contains the passions and desires, which animals have in common with man. *τὸ πνεῦμα* (the spirit) is the highest and distinctive part of man. In 1 Thess. Paul says: "I pray God your whole spirit, soul, and body be preserved blameless unto the coming of our Lord Jesus Christ." "Dictionary of Phrase and Fable," E. Cobham Brewer, p. 1163.

have an assumption that all customs, all significant episodes in the life of individuals can be carried directly back to the operation of instincts. . . . Only the hold of a traditional conception of the singleness and simplicity of soul and self blinds us to perceiving what they mean: the relative fluidity and diversity of the constituents of selfhood.”¹

McDougall is still more brief with the soul; he says that “ancient psychology accepted the soul, and was chiefly concerned to distinguish the various functions of the soul and to assign them seats in the various parts of the body. In the modern period this type developed into what is generally called ‘faculty psychology.’ . . . Both the older and the later form of faculty psychology have long been discredited. The conception of a soul or mind endowed with certain most fundamental faculties is one that we cannot wholly dispense with.”²

From Dewey and McDougall, I turned to my friend James McKeen Cattell, eminent

¹ “Human Nature and Conduct,” John Dewey, pp. 94, 138.

² “Outline of Psychology,” William McDougall, pp. 12, 13.

psychologist and editor of *Science*, asking him if his fellow psychologists had really lost the soul. He replied: "I can talk more intelligently about any other subject than the soul. *It is well known that psychology lost its soul long ago and is said now to be losing its mind.* You should inquire of Descartes and the Catholic Church; it is a good subject for a palæontologist like yourself!"

Hunting in the chambers of my memory for an explanation of this loss of the soul by psychologists, I asked Cattell if he recalled the sensation made by a paper entitled "The Normal Knee-Jerk." He reminded me that this was the opening article in Stanley Hall's new *Journal of Psychology*, started in the year 1887. This article was the curtain-raiser for the long-ensuing quest of the spirit of man by laboratory methods, mechanical, chemical, analytical, that has resulted in psychology wandering through the mazes of brain and nerve and sense-organ physiology, in which all vision of the soul has finally been lost.

PHYSICISTS REDISCOVER THE SOUL

It appears that we may turn to physicists and physiologists for a rediscovery of the soul and the spiritual nature of man. Robert A. Millikan, the last Nobel Prize man in physics, tells us in 1921 that from his point of view there are only two ideas or beliefs upon which the weal or woe of the race depends and that *the most important thing in the world is a belief in the reality of moral and spiritual values.* "It was because we lost that belief that the World War came, and if we do not now find a way to regain and strengthen that belief, then science is of no value. But, on the other hand, it is also true that even with that belief there is little hope of progress except through its twin sister, only second in importance, namely, belief in the spirit and the method of Galileo, of Newton, of Faraday, and of the other great builders of this modern scientific age,—this age of the understanding and the control of nature, upon which let us hope we are just entering."¹

¹ "The Significance of Radium," R. A. Millikan, *Science*, July 1, 1921.

EUCKEN AND RATHENAU

Long before 1920 the *rapprochement* between theology and science was initiated in Germany by Rudolf Eucken, of Jena, who won the Nobel Prize in literature in 1908. Eucken contended that "the age must win for itself an essentially new form of Christianity answering to that phase of the Spiritual Life to which the world's historical development has led us. . . . The more clearly we realize that if Reason does not reside in the whole structure of the universe, it cannot be found in any single spot of it,—the sooner shall we be entitled to hope that the religious problem will win back the passionate enthusiasm that is its due, and that our work on it will no longer assume the attitude of speculative reflection, but pass into the constructive action of a forward policy." ¹

More recently Walter Rathenau gave the noblest expression of this spirit:

Yet as surely as we know that the awakening soul is the divine sanctuary for which we live and are, that love is the redeemer who will liberate

¹ "Christianity and the New Idealism," Rudolf Eucken.

our innermost good and will weld us to a higher unity, just so surely do we recognize in the inevitable world-struggle of mechanization the one essential—the will toward unity. In so far as we oppose to mechanization the token at which it pales, namely, transcendental philosophy, spiritual devotion, faith in the absolute; in so far as we illuminate the true nature of mechanization, reaching out to the secret core of the will to unity—so far shall mechanization be dethroned, and constrained to service. . . . Woe to the race and to its future should it remain deaf to the voice of conscience; should it still be petrified in materialistic apathy; should it rest content with tinsel; should it submit to the bondage of selfishness and hate. We are not here for the sake of possessions, nor for the sake of power, nor for the sake of happiness; we are here that we may elucidate the divine elements in the human spirit.¹

There is more warmth in the rediscovery of the soul by Rathenau than there is in the chilling counsel on conduct by our psychologist Dewey, who says that “a morals based on study of human nature instead of upon disregard for it would find the facts of man continuous with those of the rest of nature, and would thereby ally ethics with physics

¹ “Was Wird Werden,” Walter Rathenau.

and biology. It would find the nature and activities of one person coterminous with those of other human beings, and therefore link ethics with the study of history, sociology, law, and economics. . . . Until the integrity of morals with human nature and of both with the environment is recognized, we shall be deprived of the aid of past experience to cope with the most acute and deep problems of life.”¹

In England, religious as well as scientific opinion is still widely divided. The *rapprochement* between theology and science probably began in the spiritual emotions aroused in all minds during the World War, but this movement first took outward expression at the Cardiff meeting of the British Association of 1920 in an enlightened sermon by Reverend E. W. Barnes, distinguished mathematician, Fellow of the Royal Society, Canon of Westminster, and now Bishop of Birmingham. As reported in *Nature* of September 2, 1920, “not for a long time has such a conciliatory attitude been presented to men of science by

¹ “Human Nature and Conduct,” John Dewey, pp. 12, 13.

a leader in the Church as is represented by Canon Barnes's address. The position taken up in it is one upon which the two standards of science and religion can be placed side by side to display to the world their unity of purpose. For Science and Religion are twin sisters, each studying her own sacred book of God and building a structure which remains sure only when established upon the foundation of truth. . . . Whatever the end may be, we are urged to the quest by that something within ourselves which has produced from a primitive ancestry the noblest types of intellectual man, and regards evolution, not as a finite, but as an infinite process of development of spiritual as well as of physical life."

HARNACK AND HUXLEY'S PUPIL MORGAN

The editor of *Nature*, in reviewing the epoch-making Conference of Modern Churchmen at Oxford at the end of August, 1925, quotes the scientific theologian Harnack: "In spite of intense effort our modern thinkers have not succeeded in developing a satisfac-

tory system of ethics and one corresponding to our deepest needs on the basis of monism. They will never succeed in doing so."

From England also, in the Gifford Lectures of 1922, comes C. Lloyd Morgan's "Emergent Evolution." Morgan, one of the most eminent pupils of Huxley, is at once experimental biologist, psychologist, natural philosopher. His volume reflects his culminating life-thought, which began in youthful conversation with Huxley. Huxley asked what the young student Morgan understood by "innate powers" and Morgan replied: "May not an internal formative tendency be as distinctly recognized as an internal conservative tendency?" Whereas the Catholic protagonist Mivart, and subsequently the great naturalist Wallace, dwelt upon the idea of the leap or sudden advance from the animal to the human state of mind and of soul, Huxley in this conversation dwelt upon the absence of any leap, upon continuity in both brain and mind from the animal state to the human stage. Morgan asked on what grounds Huxley spoke of brain as an antecedent of thought and why

one might not follow Spinoza in regarding thought and brain as alike playing their parts in causing the evolution of man. In conclusion Huxley dismissed the neophyte Morgan with the encouraging words, "You might well make all this a special field of inquiry."

"CREATIVE" AND "EMERGENT" EVOLUTION

The outcome of this kindly advice is the constructive scheme of evolution to which Morgan has devoted his life, as summed up in his volume "Emergent Evolution." It differs from Bergson's famous work, "Creative Evolution," in containing the purposive principle that "leads upwards towards God, as directive Activity within a scheme which aims at constructive consistency." Morgan continues that there may be something more in the heart of events than efficiency, something more than causation, and for this he takes the risk of "the higher acknowledgment, the Creative Source of evolution—this is God." Of the relation of brain and thought he says that the brain is *par excellence* the organ of the guidance of behavior; for ex-

ample, the form and color are contained in the rainbow, but "it is the paradox of beauty that its expressiveness belongs to the beautiful thing itself and yet would not be there except for the mind." If the idealist assert that color lives only at top, *i. e.*, in the mind, irrespective of physical correlates in the organism; or if the realist assert that it lives only at bottom, *i. e.*, in the thing, irrespective of psychical correlates in the organism, Morgan submits that each goes beyond the evidence. Passing on from this principle of pure causation Morgan thus sums up his philosophy:

Hence it is taken for granted as scarcely open to question by practical folk, that mind is pre-eminently a cause of certain noteworthy changes in the face of nature, and is in a very special sense active,—so much so that the activity we feel, when through exercise of the will we are ourselves causes, best illustrates what is meant by causal activity. Carry this a stage further, lifting it to a higher plane of thought, and we have the widely accepted belief that ultimately all observable change is due to some form of Spiritual Activity.

The timeliness of Morgan's search of the

spiritual is that it springs from the experience and observation of a highly trained zoologist and experimental psychologist—certainly a peer in his field of research. It is not the perishable closet philosophy of Herbert Spencer nor the brilliant abstract thought of Henri Bergson, thought not based on personal experience or experiment. In reviewing his position Morgan states that “emergent evolution works upwards from matter, through life, to consciousness which attains in man its highest reflective or supra-reflective level. It accepts the ‘more’ at each ascending stage as that which is given, and accepts it to the full. The most subtle appreciation of the artist or the poet, the highest aspiration of the saint, are no less accepted than the blossom of the water-lily, the crystalline fabric of snow-flake, or the minute structure of the atom. Emergent evolution urges that the ‘more’ of any given stage, even the highest, involves the ‘less’ of the stages which were precedent to it and continue to coexist with it.” He feels that we may acknowledge, on the one hand, a physical world that we observe and study

through our senses and, on the other hand, an immaterial Source of all changes therein; namely, God, on Whom all evolutionary processes ultimately depend. "In my belief in God, on Whom all things depend, I am certainly not alone. I would fain not stand alone in combining with this belief, and all that it entails, that full and frank acceptance of the naturalistic interpretation of the world which is offered by emergent evolution." ¹

MARTIN AND HALDANE ON CONDUCT

In England again, Professor J. S. Haldane, eminent physiologist, in his essay, "Biology and Religion,"² tells us that he cannot regard the mechanistic theory of life as tenable; that "it involves quite impossible assumptions and leads us nowhere in respect of the characteristic phenomena of life. Not only the newspapers, but also scientific men, continue to speak of the mechanism of life and heredity; I confess that such an expression has no meaning whatsoever to me. We cannot

¹ "Emergent Evolution," C. Lloyd Morgan, pp. 33, 89, 226, 229, 276, 297-299.

² "Biology and Religion," John Scott Haldane.

dispense with the distinctive conception of life. Let there be no mistake, however, about what this implies. It implies that the old conception of visible reality which Galileo and Newton set forth has broken down; and that there is no use in appealing to that conception in support of a mechanistic theory of life. Life would be unintelligible on that conception; but it is reality that science has to deal with, and not an ideal world of mechanism."

As to religion and conduct, Haldane adds: "We are the children of a materialistic age. We look for a soul consisting, if not of ordinary matter in the mechanical sense, yet of something which is only a thinly veiled imitation of it. We look, also, for a similarly constituted God. Such entities can never be found. God is with us, in us, and everywhere around us, as Jesus taught. . . . If I thought that my country could get on equally well without churches I should not care what was taught in them. But I do not think so. We need to be constantly reminded of that spiritual reality which manifests itself in willing

service of every kind, and without the perception of which our country would relapse into chaos."

American scientific and philosophic thought does not lead; it follows that of England and of Germany; also that of France, where since the World War there has been a spiritual and religious revival, although not, so far as the writer knows, in the minds of scientific men. However, the recent American spiritual movement did not come from abroad, but from the indignation aroused by the ignorant assaults of William Jennings Bryan on the evolution theory. In 1923 a statement was drawn up by thirty-five prominent Americans, among whom were fifteen eminent scientists, including four mathematical physicists (Millikan, Pupin, Noyes, Birkoff), one astronomer (Campbell), seven biologists (Welch, Conklin, Coulter, Osborn, Merriam, Walcott, Mayo), two civil engineers (Carty, Dunn), one psychologist (Angell). This "Joint Statement upon the Relations of Science and Religion" is partly cited at the beginning of this article, and it concludes with the following sentence:

“It is a sublime conception of God which is furnished by science, and one wholly consonant with the highest ideals of religion, when it represents Him as revealing Himself through inbreathing of life into its constituent matter, culminating in man with his spiritual nature and all his Godlike powers.”

Many other eminent physicists, astronomers, biologists, and psychologists of America would naturally decline to subscribe to such a “credo of faith” as this, either because they are still sincerely convinced of the adequacy of the mechanistic theory of philosophy and of the psychologic creeds for the conduct of life, such as we have cited from Dewey and McDougall, or because they prefer to remain in the perfectly consistent and defensible fortress of agnosticism erected by my old friend and teacher Huxley.

For my own part, I aided my friend Millikan in the wording of the joint statement of the thirty-five American religious leaders, scientists, and men of affairs, and, with the fourteen other scientists, I signed it because I am thoroughly convinced that the natural-

ist needs a credo or profession of his faith, even if this credo is very different from that drilled into his youthful mind and memory before the world entered into universal acceptance of the law of evolution.

I well remember the final address of a distinguished physiologist, Henry Newell Martin, also a pupil of Huxley, before the American Society of Naturalists in Boston, in which he said, so far as I recall: "We science teachers have been making a great mistake; we have been developing the minds of our students and neglecting their souls." These words made a profound impression. I also recall a conversation with Huxley about the immortality of the soul and how reverently he approached this question. The inscription on his gravestone, by Mrs. Huxley, is consistent with his agnostic attitude of mind:

And if there be no meeting past the grave,
If all is silence, darkness, yet 'tis rest;
Be not afraid, ye waiting hearts that weep,
For He still giveth His beloved sleep,
And if an endless sleep He wills, so best!

Many of us are familiar with Huxley's

tribute to the Bible, not only as one of the most exquisite in diction, but as one of the most profound in conviction that our age needs the lofty moral teachings of the Bible. Huxley himself was brought up with very strict religious training by a gifted mother who was a devout Sabbatarian. In the life of this revered teacher and in the lives of many friends and colleagues in various branches of science of similar religious training, I have observed qualities of truthfulness, of straightforwardness, of righteousness, of self-effacement that are ingrained in human character by the right kind of religious training and of which human character is defrauded by bigotry, by blind adherence to dogma, and by the religious fanaticism of such men as Bryan and Straton.

THE FAILURE OF PURE MECHANISM

These are the main ethical grounds for the credo of a naturalist. The philosophical and metaphysical grounds for a credo are of an entirely different order. They spring from the failure of materialism and of pure mechanism to give an interpretation of creative evolution

that satisfies our reason. Our youthful confidence in the powers of reason has been shattered; like Icarus, we have taken our flight, and the wings of reason have ceased to sustain us.

If this thought of the impotence of human reason impresses the physicists, it impresses biologists still more cogently. Many biologists have entirely abandoned mechanistic theories of adaptation and have frankly revived the old purposive interpretation of Nature, in the guise of vitalism, or *élan vital*. I do not belong to any of these schools, but if I have made a single contribution to biology which I feel confident is permanent, it is the profession that living Nature is purposive; it is the profession that Democritus was wrong in raising the hypothesis of fortuity, and that Aristotle was right in claiming that the order of living things as we know them precludes fortuity and demonstrates purpose.

WORDSWORTH EXPRESSES OUR CREDO

This purpose pervades all Nature, from nebula to man. Herbert Spencer may call it

the Unknowable; the naturalist, with Wordsworth, may call it the Wisdom and Spirit of the Universe.

Wisdom and Spirit of the Universe!
Thou Soul, that art the Eternity of thought
And givest to forms and images a breath
And everlasting motion!

V

THE EARTH SPEAKS TO BRYAN

Bryan's pledge of 1922: *The real question is, Did God use evolution as His plan? If it could be shown that man, instead of being made in the image of God, is a development of beasts we would have to accept it, regardless of its effect, for truth is truth and must prevail. But when there is no proof we have a right to consider the effect of the acceptance of an unsupported hypothesis.*

This is Bryan's second line of defense, namely, that the evidence for the evolution of man is wholly inadequate. This is met by the reply that there is none so blind as he who *will* not see, none so deaf as he who *will* not hear.

The resonant voice of the earth is dwelt upon in this chapter, in which Osborn replies to Bryan and the fundamentalists in the language of the Bible. The overwhelming evidence for human evolution is summed up in two subsequent chapters.

THE EARTH SPEAKS TO BRYAN

Bryan does not fulfil his pledge — The Tennessee trial a new inquisition — The enlightened words of Dorlodot — The fundamentalists and the modernists of 450 B. C., Æschylus and Job — The hieroglyphics of palæontology — Discovery of the Stone Age in central Asia — The homeland of an alert race — The prehistory of religion.

THREE years ago William Jennings Bryan made a pledge which he has not fulfilled. This pledge was published on the Lord's Day, February 26, 1922, and was read by a million people. It was so sincere in tone and was accompanied by so earnest a statement that I for one took it at its face value and, trusting that the pledge would be kept, published on the following Sunday, March 5, a solemn reply entitled "Evolution and Religion."

I call attention to the character of this pledge: *Truth is truth and must prevail.* Many of my scientific friends ask me: "Why answer Bryan?" I reply that to me Bryan is not an individual; he is a type. He presents the Gospel to thousands of Americans all over

the land who are convinced by his sermons that there is some antagonism between the Creator and His Creation, between God and Nature.

Bryan's gospel is not a truth; it is an ill-starred state of opinion, disastrous to true religion, disastrous to morals, disastrous to education. As recently as January 30, 1925, we read in the daily paper:

TENNESSEE LIKES BRYAN

ANTI-EVOLUTIONISTS PASS BILL BARRING THEORIES
IN SCHOOLS

Nashville, Tenn., Jan. 28.—The lower house of the Tennessee General Assembly, voting 71 to 5, passed a bill prohibiting the teaching of evolution in the common schools.

A NEW INQUISITION

The actual effect of this bill is the declaration by the legislature of one of our oldest and finest States that the Truth must not be taught in the schools of the State. Since 500 B. C. such legislation has repeatedly come from ecclesiastical assemblies and from in-

quisitorial chambers but never before in the history of mankind from a legislative assembly such as that of the State of Tennessee. That such an inquisition should arise in the United States is almost incredible; that teachers in the schools of Tennessee should be compelled to deny the truths taught by Nature or lose their means of livelihood puts the State back exactly four centuries to the inquisitorial period of Spanish history.

THE WORDS OF DORLODOT

Let us commend to these new inquisitors, misled by Bryan, the enlightened words of Canon H. de Dorlodot, D.D., D.Sc., delegate from the Catholic University of Louvain, Belgium, on the occasion of the Darwinian Centenary at Cambridge:

It is no exaggeration to say that, in showing us a creation more grandiose than we had ever suspected it, Charles Darwin completed the work of Isaac Newton; because, for all those whose ears are not incapable of hearing, Darwin was the interpreter of the organic world, just as Newton was the voice from heaven come to tell us of the glory of the Creator, and to proclaim that the

universe is a work truly worthy of His hand. And of these two illustrious interpreters of nature, who were nurtured by your glorious university, it is permissible to say with the psalmist:

"There is no speech nor language, where their voice is not heard.

*Their line is gone out through all the earth, and their words to the end of the world."*¹

ÆSCHYLUS AND JOB

Inasmuch as there can be no antagonism between the Creator and His Creation, denial of the truths of Nature is atheism disguised as religion. It is an extremely ancient form of atheism, of which we have written records as far back as five centuries B. C. These records we find in the two greatest epics of human suffering—the Book of Job and the "Prometheus Bound" of Æschylus.

The Book of Job, dating back to 450 B. C., is contemporary with "Prometheus Bound" of the years between 467 and 458 B. C. Job contains the reflections of the earliest Hebrew or Semitic writer on the relations of God to

¹ "Darwinism and Catholic Thought," Canon de Dorlodot, p. 177.

Nature, of Nature to Man. While earlier books of the Bible, from those of Moses, 1300–1200 B. C., to the Psalms, which were collected, edited, and in large part composed between 520 and 150 B. C., are full of the inspiration and glory of Nature, Job is the first to enjoin the scientific study of Nature. He presses his admonitions by a long and eloquent survey of the wonders of the earth, of the sea, and of the heavens, which baffle human understanding; he finds the universe full of order, of perfect adaptation to environment, and of beauty, full of lessons and teachings to man. Bildad combats Job's idea of the perfection of creation and declares that the Creator is so superior to His handiwork that even "the stars are not pure in His sight" (Job 25 : 5) !

God rebukes both Bildad and Job and declares that Nature is the direct expression of His power and wisdom. In this declaration and in the Psalms are the foundations of true theism and true religion. Our moral and spiritual nature is strengthened, not weakened, by the spiritual and moral struggle for existence.

In our perpetual search for Truth we may remind the Bildads and the Bryans of the world of the rebuke of the Lord: "Then the Lord answered Job out of the whirlwind, and said: Who is this that darkeneth counsel by words without knowledge? (38:1, 2). . . . Shall he that contendeth with the Almighty instruct him? He that reproveth God, let him answer it (40:2)"; and of Job's penitence: "Who is he that hideth counsel without knowledge? therefore have I uttered that I understood not; things too wonderful for me, which I knew not (42:2, 3)."

The spirit of scientific inquiry seems to have pervaded the atmosphere 500 B. C.; it was doubtless a subject of discussion among intellectual lights all around the Mediterranean. Also in the atmosphere, in the supposed interest of religion, was the spirit of repression of scientific inquiry. In Greece at the time, inquiry into the truths of Nature was regarded as atheistic and therefore punishable by the gods.

Undoubtedly William Jennings Bryan had his prototypes 500 B. C., who through oratory

and an appeal to an offended Olympus made the way of questioning the earth very difficult. The whole essence of "Prometheus Bound" is the dire punishment of Prometheus for having dared to promote the welfare of man through the scientific exploration of the earth. Prometheus is the personification of inquiry into the laws of Nature for the welfare of man. After a glorious recital of the rise of man through discoveries in astronomy, in architecture, in mining, in medicine, Prometheus places foremost the gift to man of reason:

The miseries of men

*I will recount you, how, mere babes before,
With reason I endowed them and with mind:
And not in their disparagement I speak,
But of my gifts to memorize the love:
Who, firstly, seeing, knew not what they saw,
And hearing did not hear; confusedly passed
Their life-days, lingeringly, like shapes in dreams,
Without an aim; and neither sunward homes,
Brick-woven, nor skill of carpentry, they knew;
But lived, like small ants shaken with a breath,
In sunless caves a burrowing buried life:
Of winter's coming no sure sign had they,
Nor of the advent of the flowery spring,
Of fruitful summer none: so fared through each,*

*And took no thought, till that the hidden lore
Of rising stars and setting I unveiled.*¹

THE HIEROGLYPHICS OF PALÆONTOLOGY

In my reply to Bryan I quoted a verse from the Book of Job that has always impressed me: *Speak to the earth and it shall teach thee* (Job 12:8). This admonition of the great Shemite and the lofty humanitarianism of Æschylus direct our attention to the fact that Nature has been speaking since the dawn of humanity in no uncertain tones to those minds and hearts which are open to its voice. It may be in the earth, it may be in the wind, it may be in the earthquake, it may be in the fire, or it may be only in the "still small voice"; it may be serious, solemn, awe-inspiring, and difficult to comprehend, like recent marvelous discoveries in physics and astronomy; it may be small and apparently insignificant, while actually profoundly important and significant, like many of the discoveries in anthropology. To those serious and earnest seekers after the Truth, from 500 B. C. to the present time, we have the contrasting atti-

¹ "Prometheus Bound," Æschylus. Translation by Robert White-law.

tude of the Great Commoner; if all the evidence for the Truth were piled as high as Ossa upon Pelion, if proof were heaped upon proof, the Truth would not prevail with him, because all the natural avenues of the Truth are tightly closed.

It is noteworthy that shortly after his pledge to accept the Truth appeared in 1922, the Earth spoke to Bryan and spoke from his own State of Nebraska, in the message of a diminutive tooth, the herald of our knowledge of anthropoid apes in America. This *Hesperopithecus* tooth is like the "still small voice"; its sound is by no means easy to hear. Like the hieroglyphics of Egypt, it requires a Rosetta Stone to give the key to interpretation. Our Rosetta Stone is comparison with all the similar grinding teeth known, collected from all parts of the world, and described or figured in learned books and illustrations. By these means this little tooth speaks volumes of truth—truth consistent with all we have known before, with all that we have found elsewhere.

It happens that teeth, incased in enamel, the most enduring animal substance in the

whole order of living Nature, defy all the vicissitudes of time and of subterranean burial and take first rank among Nature's hieroglyphics of the past.

I once travelled several thousand miles to see a single tooth, known to science as *Microlestes antiquus*, signifying "the ancient little robber." Despite its "rhætic" age, surpassing the hoary antiquity of Jurassic time, this tiny tooth, no larger than a pin-head, is shown with its ancient enamel lustre and truthfully tells an unvarnished tale of the life conditions of an epoch in which the "ancient little robber" flourished. Some years afterward, while dining with the Right Reverend William Manning, then rector of Trinity Church, I sat next the Archbishop of York, the Most Reverend Cosmo Gordon Lang. Knowing the Englishman's aversion to commonplaces like the weather and politics, I at once broached the subject of *Microlestes*. I said: "Your Grace, do you know why York is so famous?" He smiled and replied that he supposed it was because of the beauty of its cathedral. "No," I answered, "it is because it houses the oldest

tooth in the world!" He confessed that he had never seen this tooth but would certainly on his return to York repair to the museum for the purpose. This odontological introduction led us genially to the subject of Theodore Roosevelt and his Romanes Lecture in Oxford, as I have narrated elsewhere.

The world-wide interest aroused by the discovery in Nebraska of *Hesperopithecus*, "the ape of the western world," is in widest possible contrast to the diminutive and insignificant appearance of the single grinding tooth of the right side of the upper jaw, which speaks of the presence of the higher or manlike apes in our western country at a time when the ancient "Territory of Nebraska" was in close touch with the animal civilization of Asia and of western Europe. The evidence of the tooth is strongly supported by many other and more complete fossil specimens that speak of a fresh tide of migration from the Old World to the New perhaps a million years ago, including antelopes, rhinoceroses, and peculiar Asiatic types of horses.

So it has been with every other notable dis-

covery bearing directly or indirectly upon the great question of the origin and evolution of man. The earth has buried its secrets as if it were reluctant to reveal the history of our past.

What shall we do with the Nebraska tooth? Shall we destroy it because it jars our long preconceived notion that the family of man-like apes never reached the western world, or shall we endeavor to interpret it, to discover its real relationship to the apes of Asia and of more remote Africa? Or shall we continue our excavations, difficult and baffling as they are, in the confident hope, inspired by the admonition of Job, that if we keep on speaking to the earth we shall in time have a more audible and distinct reply? Certainly we shall not banish this bit of truth because it does not fit in with our preconceived notions and because at present it constitutes infinitesimal but irrefutable evidence that the man-apes wandered over from Asia into North America.

THE STONE AGE IN CENTRAL ASIA

Moreover, the mystery surrounding the discovery of *Hesperopithecus* is hardly greater than those which have been surmounted in the prehistory of man elsewhere—in Spain, in Britain, in France, in Germany, in Italy, in Hungary, in the Island of Java, in the Ordos of Inner Mongolia. Just at the moment when Asia seemed to have lost its time-honored Biblical reputation as the Garden of Eden of the human race, two devout Roman Catholics—the one a distinguished missionary of northern China, Père Emile Licent, the other a distinguished palæontologist, Abbé Pierre Teilhard de Chardin—made an epoch-making discovery of palæolithic man of Aurignacian and Mousterian age in the northern valley of the Yellow River bordering China and southern Mongolia. Flint implements were found in the greatest abundance, fashioned after the superior Aurignacian technic, which indubitably established the presence of a large colony of men in this now arid region of central Asia during the more favorable and humid climate

of the closing Ice Age. Skulls and bones of these men have not been found, but their flint industry speaks of an order of intelligence as high as that manifest in the finely formed skulls and foreheads of the Aurignacian men recently disinterred at Solutré, France.

Only a few months before, it had been proclaimed by one of the leading American anthropologists, Doctor Ales Hrdlička, of the United States National Museum, that Europe rather than Asia may have been the cradle of the human race. This proclamation rested on the overwhelming testimony of the presence of fossil man in all parts of western Europe, discoveries dating from the first ancient flint implement found in 1690, and extending over 233 years to the sepulchres of Aurignacian man found in 1923 near Solutré, France.

This discovery of the Old Stone Age in north China is consistent with the discovery of the Neolithic or New Stone Age culture about three years ago in China, as revealed by the Swedish explorer, J. M. Andersson, who has now been called to the University of Stockholm. It is also in accord with the

prophecies of W. D. Matthew and of the present writer that the high plateau region of central Asia will prove to be the chief cradle of the human race.

THE HOMELAND OF AN ALERT RACE

It is upon plateaus and relatively level uplands that human and prehuman life is most exacting and response to stimulus most beneficial. An alert race cannot develop in a forest—a forested country can never be a centre of ascent for man; nor can the higher type of man develop in a lowland river-bottom country with plentiful food and luxuriant vegetation. Mongolia has always been an upland country, through the Age of Mammals and before. It was probably a country only in part forested, mainly open, with exhilarating climate and conditions sufficiently difficult to require healthy exertion in obtaining food-supply. In the uplands of Mongolia conditions of life were apparently ideal for the development of early man, and since all the evidence points to Asia as the place of origin of man, and as Mongolia and Tibet, the top of

the world, are the most favorable geographic regions in Asia for such an event, we shall sooner or later find the remote ancestors of man in this section of the country.

This idea may be treated only as an opinion, but it is an opinion sufficiently sound to warrant the extended investigation now going forward, and which is to be continued for the next five years under the leadership of Roy Chapman Andrews in the hope of finding evidence of primitive man in central Asia.¹

THE PREHISTORY OF RELIGION

Man is what he is because he has never had an easy time of it; for at least 500,000 years he has been engaged in an incessant struggle for existence, a struggle in which his intelligence and his moral nature have played a very large part, certainly the predominating

¹ In a cable, dated Peking, June 1, 1925, Roy Chapman Andrews announced: "*Great success. Immediately discovered more dinosaur eggs and late Palæolithic [Old Stone Age] cultures, corresponding to European Azilian [Upper Palæolithic stage]. Thousands flints, artifacts. Work just begun.*" This first definite proof of the existence of men of the Old Stone Age on the high Mongolian plateau, taken together with the discovery of the Old Stone Age man in northern China, tends to strongly confirm the theory that the high central Asiatic plateau was one of the chief homes of primitive man.

part in the higher races of man. The spiritual life of man, as will be more fully pointed out in another chapter, had its dawn extremely far back in geologic time, and belief in life after death was an early development. Religion, in the sense of belief in a supernatural power or powers, followed later and was accompanied by superstition, magic, and the creation of a priesthood as intermediaries between man and the higher powers.

The primitive spiritual life of man is no longer a matter of guesswork and hypothesis, as it was at the close of the nineteenth century when Herbert Spencer and Edward B. Tylor were theorizing upon the origin of religion. Through the religious practices and ceremonies of the existing peoples, the prehistory of religion comes to us in no uncertain tones when we speak to the earth, in stone amulets and charms, in ceremonial burials full of tender human sentiment, in sculptures, paintings, and engravings, in primitive written texts which we some time may be able to decipher. Some of these records go back over 50,000 years, when the custom of burial began; others

are of more recent date, belonging to the second cave period.

The truth of the records which the earth reveals is truth of the most imperishable order, and it must prevail. It may inconvenience us, it may disturb us, it may completely upset many of our scientific ideas, it may run counter to our religious views; our duty is not to avoid the consequences of the truth but to face them and overcome them.

VI

THE TENNESSEE TRIAL

The Tennessee trial becomes the peak of the controversy and immediately attracts the attention of the entire civilized world. A subject of ridicule in the unthinking press, it is taken with great seriousness by some of the most distinguished scientific teachers. The fundamentalists summon their most eloquent leader to the attack, while the radicals array themselves on the side of the defense. The trial consequently takes its place as the latest of the many great struggles between science and theology.

In this chapter, which was hurriedly written and printed on the very eve of the trial, it is sought to show the real significance of the Scopes trial, its historic position, and to point out in advance that the real defendant is not the young Tennessee teacher.

THE TENNESSEE TRIAL

Giordano Bruno and Galileo; the seventeenth and twentieth centuries — Bryan the real defendant, Scopes the real plaintiff — Distinction between educational liberty and license — Difficult for Bryan to unseat a well-established law of Nature — The testimony of the rocks — The travail of a million centuries — Man not the descendant of an ape — Our superior ancestry — The still small voice — The creative evolution of man.

THERE is a wide difference of opinion in the United States, and even in other parts of the civilized world, about the Tennessee trial. Most people express themselves as strongly opposed to it. I for one am strongly in favor of it, and I am confident that it will clear the atmosphere, as in the past great historic trials of a similar character have done.

GIORDANO BRUNO AND GALILEO

Fortunately, we have reached a stage of civilization where there is no question of burning at the stake, as with Giordano Bruno, or of imprisonment, as with Galileo when he de-

clared that the earth revolved around the sun and that the sun itself was in motion. In the Tennessee case even the distinguished plaintiff declares that the defendant will lose only his living; he will not be thrown into prison, he will not be excommunicated, he certainly will not be burned at the stake. Beginning in 1593, Giordano Bruno was imprisoned for seven years, and on February 17, 1600, was burned at the stake for firmly holding to his chief maxim that "the investigation of Nature in the unbiased light of reason is our only guide to truth." Beginning June 24, 1633, Galileo Galilei, at the age of seventy, was imprisoned and later kept in close confinement for adhering to his theory of the motions of the earth and of the sun as against the orthodox astronomical teaching of his times.

BRYAN THE REAL DEFENDANT, SCOPES
THE REAL PLAINTIFF

The reason I am in favor of this trial is that I take a view entirely different from that of most of my fellow citizens as to who is really on trial, as to which is the plaintiff and which

the defendant in the case. The facts in this great case are that William Jennings Bryan is the man on trial; John Thomas Scopes is not the man on trial. If the case is properly set before the jury, Scopes will be the real plaintiff, Bryan will be the real defendant.

The brief in this case was best phrased by Bryan himself with his usual terseness and clearness when he opened this discussion in one of the great American newspapers in the year of our Lord 1922:

“The Real Question Is, Did God Use Evolution as His Plan?”

This is the supreme issue which the Tennessee court and the judge and jury will have to pass upon. All the other issues, such as personal rights, rights of opinion, rights of free speech, constitutional rights, educational liberty, which will undoubtedly be brought into the case by the counsel on both sides and which may for a time befuddle the minds of the jurors, are mere temporary side issues and will fade into insignificance in comparison with the supreme issue.

EDUCATIONAL LIBERTY AND LICENSE

If Scopes has been teaching the truth to his students he will win; if he has been teaching untruths he will lose, and will deserve to lose. I am a great believer in educational liberty, but I do not believe that any teacher, high or low, should pass off his personal opinions on the tender minds of students; he is at liberty only to teach truths which are well and soundly established. In this case the evolution of higher and of lower forms of life is as well and as soundly established as the eternal hills. *It has long since ceased to be a theory; it is a law of Nature as universal in living things as is the law of gravitation in material things and in the motions of the heavenly spheres.*

DIFFICULT FOR BRYAN TO UNSEAT A LAW
OF NATURE

If Bryan and his learned counsel can prove that God did *not* use evolution as His plan they will deserve our gratitude, and William Jennings Bryan will come out of the court one of the saviors of American youth; if, on the

other hand, the affirmative decision is reached and it is shown by the learned counsel for the defense that God *did* use evolution as His plan, then John Thomas Scopes will walk out of court a free man, the governor and legislature of the State of Tennessee will convene to revise their recent legislation, and William Jennings Bryan will suffer a greater defeat than any he has had at the polls. Not only will Scopes be free, but Truth will be free, and the truths of Nature as distinguished from the transitory opinions of either scientist or theologian will be freely taught to the youth of our nation.

Thus Haman will hang on the gallows erected for Mordecai!

Nor will the twelve honest, God-fearing Tennesseans who are put on oath in the Dayton court constitute the whole jury; a higher jury will be the grand jurors of all created time, whose voices are heard in the testimony of the rocks, in which the injunction is observed: "Speak to the earth and it shall teach thee." (Job 12:8.)

THE TESTIMONY OF THE ROCKS

“Day unto day uttereth speech, and night unto night sheweth knowledge.” (Psalm 19:2.)

THE EARTH SPEAKS, clearly, distinctly, and, in many of the realms of Nature, loudly, to William Jennings Bryan, but *he fails to hear a single sound*. The earth speaks from the remotest periods in its wonderful life history in the Archæozoic Age, when it reveals only a few tissues of its primitive plants. Fifty million years ago it begins to speak as “the waters bring forth abundantly the moving creature that hath life.” In successive eons of time the various kinds of animals leave their remains in the rocks which compose the deeper layers of the earth, and when the rocks are laid bare by wind, frost, and storm we find wondrous lines of ascent invariably following the principles of *creative evolution*, whereby the simpler and more lowly forms always precede the higher and more specialized forms.

The earth speaks not of a succession of distinct creations but of a continuous ascent, in

which, as the millions of years roll by, increasing perfection of structure and beauty of form are found; out of the water-breathing fish arises the air-breathing amphibian; out of the land-living amphibian arises the land-living, air-breathing reptile, these two kinds of creeping things resembling each other closely. The earth speaks loudly and clearly of the ascent of the bird from one kind of reptile and of the mammal from another kind of reptile.

This is not perhaps the way Bryan would have made the animals, but this is the way God made them !

THE TRAVAIL OF A MILLION CENTURIES

After the long travail of at least a million centuries there appear among the mammals the remote and humble ancestors of that great race which we ourselves have honored with the name of *Primates* because all the members of this race, like ourselves, live upon their wits, relying upon their cleverness and even intelligence in the eternal struggle for existence. In clarion tones, not with uncertain sound, the earth tells us in both the form and

the functions of our bodies and of our minds, in every nerve, in every gland, in every muscle which the nerves control, in the lower and higher centres of the brain as the royal seat of our primacy, in the bones which compose our framework, especially in the bones of the skull and jaws and of the foot and hand, that we too have ascended from lowlier ancestors not wholly dissimilar but never identical with other *Primates* to which we feel ourselves proudly superior. Let us regard them as "poor relations" if we will, they are none the less of the same handiwork as ourselves.

In Darwin's day the earth had hardly begun to speak of this relationship of ours to the other *Primates*, but Darwin's was the prophet's ear, close to the earth, which truly interpreted its feeble tones. Today the earth speaks with resonance and clearness, and every ear in every civilized country of the world is attuned to its wonderful message of the creative evolution of man, except the ear of William Jennings Bryan; he alone remains stone-deaf, he alone by his own resounding voice drowns the eternal speech of Nature.

How can I as the author of these essays, a naturalist, a professor of zoology, "a tall professor coming down out of the trees," as he calls me, contend with the resounding voice of Bryan when the voices of Nature are powerless to do so? At once I confess that I cannot contend with him, nor can I still his voice, and this has always been my attitude since February, 1922, when in reply to his article in the *New York Times* entitled "God and Evolution," I hastily wrote the first of my rejoinders, "Evolution and Religion," and thus entered the arena of Religion and Science in which the Great Commoner and myself have met at intervals during the past three years. My advice to my opponent is invariably and consistently the same; namely, to drop the methods of the lawyer, of the politician, of the statesman, even of the theologian and of the scientist, and to adopt the simple methods of the naturalist, to observe and hear for himself the great truths which the earth so clearly proclaims.

I do not enter into the well-known details of the wonderful processes of evolution as they

have been conscientiously observed in plants and animals for a century and a half. I refer inquirers after truth to the published and readily accessible works of a long line of observers, from Leonardo da Vinci in the fifteenth century to the writers of the eleventh edition of the *Encyclopædia Britannica*.

MAN NOT THE DESCENDANT OF AN APE

As for the creative evolution of man, passing by the early speculative writings of such men as Haeckel, we now have more than a dozen substantial volumes based not upon guesswork or speculation but upon the testimony yielded in the superficial layers of the earth and in caves, embracing hundreds of specimens of the fossilized remains of man, more or less ancient, more or less complete, but invariably, without a single exception, testifying to the gradual *ascent of man* from a lower to a higher state, gradually dropping one primitive bit of anatomy after another until the high, intelligent, fully human aspect is attained.

Again with clarion voice these irrefutable

witnesses of our past positively demonstrate two new and somewhat unexpected truths: first, that *man has not descended from any known kind of monkey or ape*, fossil or recent; with this truth, established not by Bryan but by the testimony of the earth, one of the chief sentimental objections to the creative evolution of man disappears forever. Second, *man has a long, independent, superior line of ascent of his own*, with a relatively erect posture, with hands free to grasp and use tools, with the thumb and forefinger capable of handling flint implements such as the graving tools and brush of the artist and, finally, the reed, pen, or crayon, with which to set down his thoughts. Challenge as we may the less perfect fossil discoveries in the Trinil sands, in the Piltdown gravels, in the Heidelberg riverbeds, no man can challenge the convincing testimony to the creative evolution of man afforded by the several complete skeletons of the race of the Neanderthal who lived 100,000 years ago, nor the perfectly preserved fossil remains of the artistic race of the Crô-Magnons who lived 30,000 years ago.

OUR SUPERIOR ANCESTRY

The Neanderthal hunters of 100,000 years ago and the Crô-Magnon artists of 30,000 years ago are not guesswork or the fabric of scientific imagination; they are realities, men like ourselves, the older one a much lower race—a veritable missing link—the other a higher race with all powers equal to our own.

At the time these fossilized artists of the higher Crô-Magnon race lived along the river borders of France all of northern Europe was sinking under the burden of the titanic glacier which covered Belgium and northern France and which drove southward great herds of the reindeer, the woolly rhinoceros, the Arctic hares and lemmings. These artists painted and modelled in clay and rock the fossilized mammoths, and no circumstantial evidence produced in court at any time in the whole history of law has ever been stronger than this evidence that these artists, these reindeer, and these mammoths lived together in the subarctic climate of southern France and northern Spain.

The low-browed Neanderthal hunting race is of far greater antiquity, a fact also established by circumstantial evidence equally strong and equally convincing. When these men hunted the woolly rhinoceros in the half-frozen rivers of southern France the titanic glaciers of the northern hemisphere reached their arms southward from the Scandinavian peaks and from the central and eastern (Laurentian) highlands of Canada, attaining such height and massiveness as to completely bury the entire State of New York, finally reaching their melting-point near the western extremity of Long Island and the centre of the State of New Jersey. This fossilized hunting race of the Neanderthals, low-browed, small-statured, ungainly, hideous of aspect, with retreating chin, broad nostrils, beetling eyebrows, is nevertheless human, beyond challenge. They had tender sentiments, they revered their dead, they believed in the future existence of the hunter in "happy hunting-grounds," as evidenced in their inclusion of the finest flint implements in the burial of their dead.

To sum up the testimony of the rocks, the

evidence as regards the creative evolution of man is as unanswerable as that of the creative evolution of the entire plant and animal world. Man is no exception to the universal law that God did use evolution as His plan.

THE STILL SMALL VOICE

And he said, Go forth, and stand upon the mount before the Lord. And, behold, the Lord passed by, and a great and strong wind rent the mountains, and brake in pieces the rocks before the Lord; but the Lord was not in the wind: and after the wind an earthquake; but the Lord was not in the earthquake:

And after the earthquake a fire; but the Lord was not in the fire: and after the fire a still small voice. (I Kings 19: 11, 12.)

Does Evolution still the voice of conscience? Does it rob us of our religion? Does it undermine our morals? If taught in the schools and colleges as Nature teaches it, will it undermine the spiritual and moral foundations and ideals of our youth, upon which our future American civilization depends?

This is the contention of Bryan and of the millions of people whom he has deceived by his eloquent references to the Bible as the source of scientific as well as of religious

truth. On this side of the case I find myself in sympathy with much of Bryan's teaching and preaching. I agree with many of his moral conclusions, I totally disagree with his premises. Our points of agreement may be clearly set forth as follows: we both believe in the Bible and in its supreme value in moral and religious instruction; we both believe in Christianity and in the principles of conduct set forth in the Sermon on the Mount; we both believe that in the future of our country we must retain the faith of our fathers in the providence of God.

Our points of disagreement, so far as I understand the Great Commoner, are chiefly as follows:

BRYAN BELIEVES

that the Bible is the infallible source of natural as well as spiritual knowledge

that the entire universe was suddenly created in 144 hours, according to literal interpretation of the first chapter of Genesis

that on the sixth day man in the fulness of his powers was

OSBORN BELIEVES

that the Bible is an infallible source of spiritual and moral knowledge

that our entire universe and the universes beyond our own represent an incalculably long period of development to their present form

that the life of our planet represents an incalculably

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BRYAN BELIEVES

suddenly created, according to Genesis 1:27: So God created man in his own image, in the image of God created he him; male and female created he them.

OSBORN BELIEVES

long period of creative evolution which was crowned with the ascent of man; that man approaches the divine through a gradual development of his spiritual, moral, and intellectual faculties.

THE CREATIVE EVOLUTION OF MAN

It is not possible to express in human language, in human conceptions, or even in human imagination the majestic processes of the universe, nor is it possible to interpret all the causes of the creative evolution of man.

Neither is this the moment to discuss more than the remaining point at issue: Does the idea of creative evolution tend to elevate or to degrade man? This issue has also been the work of ages of philosophy, going back to the early stages of human thought, certainly as far back as 600 B. C.

As I point out in Chapter II, the Christian Fathers considered this very question with consummate ability. As I attempt to show in Chapter III, a true conception of evolution compels us to adopt the highest ideals of con-

duct. Finally, I attempt to show in Chapter IV that, apart from the spiritual guidance of the Bible, Nature has been regarded from the earliest times as the work of God, full of moral beauty, truth, and splendor.

VII

THE CASE FOR HUMAN EVOLUTION
IN 1925

The editor of the *New York Times* prefaced this article (July 12, 1925) with the following comment:

The topic of the moment is, of course, evolution. William Jennings Bryan, who is playing a leading part at the Scopes trial at Dayton, Tenn., put the issue sharply when he said evolution is "guesses strung together," and again: "These men (the evolutionists) would destroy the Bible on evidence that would not convict a habitual criminal of a misdemeanor."

Thus it becomes of great interest to inquire, as the trial gets under way: "What concretely is the evidence for evolution?" The New York Times asked Doctor Osborn, President of the Museum of Natural History and foremost in the ranks of the evolutionists, to answer that question. He has done so in the following article.

THE CASE FOR HUMAN EVOLUTION IN 1925

Bryan contra mundum — The testimony of anatomy, oldest of the sciences — The ape no longer in the line of human descent — Man in a very ancient family of his own — A long and honorable line of ascent — The recently discovered Foxhall man — Prediction of the erect-walking position of the Tertiary Dawn Man — Summary of our knowledge of the fossil races of man — Probable Asiatic centre of origin and dispersal of the human race.

BY a gross perversion of the truth the present Tennessee case has taken on all over the United States the contemptuous designation of "the monkey trial," a term applied to it even by two of the great New York dailies. Against the acceptance by the newspaper-reading public of Bryan's definition of human evolution I vigorously protest, as lowering the seriousness of this case not only in the United States but throughout the world.

I present an epitome of our present knowledge of the evolution of man and of several great generalizations which have been reached

only in recent years. The first of these is that man belongs to a family of his own, called the *Hominidæ* (from the Latin word *homo*), a family including only the relatives of man, the actual ancestors of the existing races of man, and the side branches of the human race, such as the Piltdown, the Trinil, and the Neanderthal, which have become entirely extinct.

Entirely apart from this human family is the *Simiidæ* (Latin *simia*, ape), including the living and extinct anthropoid apes—the gorilla, the chimpanzee, the orang, the gibbon. These animals constitute a separate branch of the great division of primates not only inferior to the *Hominidæ*, but totally disconnected from the human family from its earliest history.

“BRYAN CONTRA MUNDUM”

Testut, the great French anatomist, compared the anatomy of man with the slave who followed the chariot of the Roman emperor in the period of imperial self-deification. The slave was engaged by the Roman Senate to

keep repeating in the ear of the emperor the admonition, "*Meminisce te hominum esse*" (Remember thou art but a man). William Jennings Bryan, like the Roman emperors, insists that he is made in the image of God, and if it should prove he is not so made there is no hope for religion or for Christianity! Yet the anatomy of Bryan, like that of all mankind, is continually testifying:

You are only a man, you are full of reminiscences of your great geologic past. Your daily and hourly existence depends on nervous, muscular, vascular, glandular, and skeletal systems which were designed not in a few hours but in many millions of years. Your own cellular structure and development from germ and embryo to manhood is a syncopated epitome of your entire past history. Every breath you draw, every accelerated beat of the heart in the emotional periods of your oratory depend upon highly elaborated physical and chemical reactions and mechanisms which nature has been building up through a million centuries.

If one of these mechanisms, which you owe entirely to your animal ancestry, were to be stopped for a single instant, you would fall lifeless on the stage. Not only this, but some of your noblest emotions and deepest sympathies, some of your

highest ideals of human fellowship and comradeship were not created in a moment, but represent the work of ages.

THE TESTIMONY OF ANATOMY

But the voice of anatomy, like the voice of all Nature, never reaches the mental ear of the Great Commoner. It is the noble province of anatomy to tell the truth, the whole truth, and nothing but the truth about the structure, the origin, and the history of man. It ranks next to astronomy as the oldest of the sciences. At the present moment, when the evidence of anatomy is ridiculed, misrepresented and caricatured, there is no exaggeration in saying that modern anatomy leaves not a shadow, not a possibility of doubt, that man has ascended from a lower to a higher state, and that the universal principle of creative evolution has been no less potent in fashioning man than in fashioning the entire plant and animal world.

The researches and explorations of a century and a half have yielded not one iota of evidence for the special and sudden creation

of a single organ or a single function in man, lower or higher; on the contrary, far beyond the dreams of Buffon, Lamarck, and Darwin, the three great opponents of the dogma of the sudden creation of man, they have yielded an overwhelming mass of anatomical and palæontological evidence for evolution.

It is the acceptance of this great truth of human ascent by men of religious and scientific beliefs, in all parts of the world, except those who have fallen under the spell of oratorical and sophistical misrepresentation, which causes me to use the subheading, "Bryan contra mundum."

My opponent speaks lightly of this overwhelming evidence for the evolution of man, because he is unfamiliar with scientific evidence of every kind and because he wilfully and deliberately misrepresents the human-evolution case. To stigmatize the Scopes case as a "monkey trial," or as an "ape trial," and thereby to create prejudice to human evolution by the distortion of truth, is a demagogic appeal which may deceive and bewilder many, but which is sixty-six years out of date. Dar-

win's opponents in the decade following the publication of "The Descent of Man" (1871) used the same demagogic methods, as, when he received his honorary degree from the University of Cambridge, a monkey was suspended in mid-air between the galleries of Sanders Theatre.

THE APE NO LONGER IN THE LINE OF
HUMAN DESCENT

By opponents of a somewhat higher grade of intelligence strong objection was, and is still, made to human descent from any existing form of anthropoid ape, such as the chimpanzee or the gorilla; quite recently the human-descent theory has been stigmatized as the "gorilla theory of human ancestry." All this despite the fact that Darwin himself, in the days when not a single bit of evidence regarding the fossil ancestors of man was recognized, distinctly stated that none of the known anthropoid apes, much less any of the known monkeys, should be considered as in any way ancestral to the human stock.

All these sentimental objections and mis-

representations are now brushed aside by research, the results of which confirm the belief that no existing form of anthropoid ape is even remotely related to the stock which has given rise to man. On the contrary, all the existing anthropoid apes—the gorilla, the chimpanzee, the orang, and the gibbon—stand far apart by themselves in the family *Simiidae*. They are increasingly specialized for arboreal life: the arms are much longer than the legs in adaptation to swinging from the branches of trees, the thumb has practically disappeared as it does in all animals expert in tree progression, the hind limbs are correspondingly shortened and the big toe is greatly enlarged and set off from the side of the foot.

When on the ground the apes are quadrupedal in gait and rise only temporarily on the hind feet. Stories of travellers about the bipedal progression and erect position of these anthropoid apes, and even the diagrams of Haeckel representing them walking on their hind feet, are myths or gross misrepresentations of the accustomed gaits and postures of

these tree-living apes. Even the gorilla, the least arboreal of these anthropoids, has been recently shown by Carl E. Akeley to be essentially quadrupedal in locomotion; it rises on its hind feet only when startled or when awaiting the attack of an enemy.

Thus the entire monkey-ape theory of human descent, which Bryan and his followers are attacking, is a pure fiction, set up as a scarecrow, which has been entirely set aside by modern anatomical research. All these animals ape or imitate man, as implied in both the native and scientific names given to them, rather than the reverse; none of them is anywhere near the true line of human ascent. Nevertheless, anatomists and zoologists from the time of Buffon onward were entirely right in pointing out that the anthropoid apes alone among all other mammals belong in a family (*Simiidae*) closest of kin to man (*Hominidae*) in their cerebral, dental, muscular and bony structure, and, as has been more recently proved, in the chemical composition of their blood as well as in the physiological reactions of their glands.

MAN IN AN ANCIENT FAMILY OF HIS OWN

Setting entirely aside these abandoned ape-monkey hypotheses of descent, modern anatomy, anthropology, and palæontology are demonstrating in the most irrefutable manner that man has a long and independent line of family ascent of his own reaching far back to the Age of Man through the Pleistocene, Pliocene, and even Miocene epochs into Upper Oligocene time, a geologic period estimated not in hundreds of thousands but in millions of years.

The new evidence for this entire independence from the apes of the human line of ascent has come with almost startling suddenness. Some years ago, when addressing the National Academy of Sciences in Washington, I stated that we must prepare our minds for a very great surprise, namely, the discovery of a distinctively human type in Pliocene time (over 500,000 years ago). This prediction was independently and immediately verified by the discovery by J. Reid Moir in a quarry at Foxhall, near Bristol, England, of an ancient fire-

place on the floor of a flint workshop where fire had been used, in which were found a number of flints of indubitable human manufacture, roughly chipped for a variety of useful purposes, in a definite geologic stratum shown positively to be of Pliocene age, because among the fossil mammals which it contained were very ancient Pliocene rhinoceroses and mastodons.

THE RECENTLY DISCOVERED FOXHALL MAN

Thus was found the Foxhall man, the first of Tertiary Age! This discovery was received with such scepticism in England that it required the support which I gave it in the *London Times* as well as that of the two leaders in the prehistoric archæology of France, Professor Louis Capitan and Abbé Henri Breuil, to establish it. We have not yet found the skull or limbs of the Foxhall man of the close of the Age of Mammals; he is known only by the tools he made, but these tools prove beyond a possibility of doubt three things: (1) He had a powerful and opposable thumb with which he grasped small flints; (2) he had a brain of con-

siderable size with which he or his ancestors discovered the arts of fire, of the chase, and of the preparation of clothing; (3) he certainly walked erect or nearly so, for only in the erect running posture could he have entered the chase, and only by the free use of his hands and thumbs could he have grasped the implements and fashioned the tools essential to the chase.

PREDICTION OF ERECT WALKING POSITION OF THE DAWN MAN

I am now prepared to make a still more startling prediction, namely, that man has been in an erect position for an enormously long period of geologic time; that when we discover the earlier Pliocene ancestors of man, still more remote than the Foxhall, we shall find that they had long lower limbs, relatively short upper limbs, well-developed thumbs, larger brains than any of their contemporaries, and that they habitually lived on the ground rather than in trees. Far back of this ground-living habit doubtless was the tree-living stage.

SUMMARY OF OUR KNOWLEDGE OF THE
FOSSIL RACES OF MAN

Here is the table of known fossil ancestors of man in descending geologic order:

Crô-Magnon Race—Large brain, full brow, prominent chin; existing 25,000–40,000 years ago. Second type of cave man.

Neanderthal and Heidelberg Race—Low brow, inferior brain, retreating chin; existing 40,000–250,000 years ago. First type of cave man was of the Neanderthal race.

Piltdown Race (*Eoanthropus*)—Flat brow, small brain, no chin prominence; existing 500,000 years ago, or near the beginning of the Age of Man.

Trinil Race (*Pithecanthropus erectus*)—Extremely low brow, smaller brain, probably retreating chin, straight thigh-bone. Very primitive side branch of human race nearly contemporary in age with the Piltdown; not an anthropoid.

Foxhall Race—Bony remains still unknown; possibly similar to Piltdown in head structure.

The second, the Trinil race of the Age of

Man, discovered by Eugen Dubois in Java, is now positively known to be of very great geologic antiquity, namely, at the very base of the Age of Man, and therefore belonging to a geologic stage more recent than the Foxhall man. Although Dubois named this man *Pithecanthropus erectus*, signifying the "erect ape-man," he was less certain about its relationship to the real human stock than we are at present, because when he wrote his original paper the prehuman characters of the brain, as revealed by the inner side of the bony brain-case, were not so well known as they are now. Recently we have received in the American Museum perfect casts not only of the top of the skull but what is known as an intracranial cast or replica of the brain itself.

This brain is certainly prehuman and not pre-anthropoid. Not only is it much larger than the brain of any anthropoid ape, but in its convolutions it is distinctly on the side of the human family (*Hominidæ*) rather than on the side of the ape family (*Simiidæ*). The femur, moreover, belongs not to a tree-living, but to a ground-living and running type; this

feature is implied in the specific name *erectus* applied by Dubois to his genus *Pithecanthropus*. These remains indicate a side branch of the human family not in the least related to the Piltdown race, but with affinities, in the structure of the brow, rather to the Neanderthaloids of Heidelberg and of Neanderthal.

The third, or Piltdown, race, of the close of the Age of Mammals or beginning of the Age of Man, after a long period of most animated dispute about the characters of the jaw and as to whether or not it belonged with the skull, is now definitely determined as a very important side branch of the *Hominidæ*. The veteran palæontologist of England, Arthur Smith Woodward, spent no less than ten years in searching through the Piltdown gravels on the spot where the Piltdown man was found, in order to further establish the characters of the type, which he named *Eoanthropus dawsoni*. I visited this locality myself in company with my friend Smith Woodward, and on looking over the ground felt absolutely assured for the first time that the jaw did belong with the skull, although it looks far more

like that of a chimpanzee than that of a human being.

The existence of the fourth, or Heidelberg-Neanderthal, race in western Europe is probably heralded by gigantic flint implements recently discovered by J. Reid Moir near Cromer on the east coast of England in the "Cromer Forest Bed," and determined by the French archæologists Capitan and Breuil as representing an ancient phase of the so-called Chellean industry, named from its discovery near Chelles in northern France. No human remains are preserved with these giant flints, but of nearly the same geologic age is the massive jaw found in the Mauer sands near Heidelberg, Germany, by Schoetensack and named *Homo heidelbergensis*. This Heidelberg man is now regarded as a river-border-living progenitor of the first caveman, *Homo neanderthalensis*, who spread all over western Europe, the Channel Islands, and Britain during the period of the last great glaciation, estimated at from 40,000 to 60,000 years ago.

It is a tragic circumstance that the skull-top of the Neanderthal man was in the hands

of both Huxley and Darwin without either of them recognizing it as the "missing link" between a lower and a higher race of man, for such it is now known to be from numerous remains of the jaws, of the skull, of the limbs found in different parts of France, Belgium, Germany and Spain, especially from three superbly preserved skulls and skeletons described by the distinguished French palæontologist, Marcellin Boule. Several stages in the evolution of this race are also known, beginning with the Heidelberg, continuing with the Krapina fossils of Croatia, and ending with the most specialized Neanderthals buried within or in front of the caverns of the Dordogne region of France. Of all the fossil races this is by far the most fully known, as to industry, as to culture and ceremonial, as to anatomy. In fact there is little more to be learned about the Neanderthals except their place of origin, which is probably in central Asia, as indicated by recent discoveries of distinctly neanderthaloid flints in the Ordos region of northern China.

PROBABLE ASIATIC CENTRE OF HUMAN
ORIGIN AND DISPERSAL

This leads us to digress for a moment on the probable centre of origin and dispersal of the human race. For one, I am a monophyletist—that is, I believe that all branches of the family *Hominidæ* came from a single great stock, characterized by erect posture, by the opposable thumb, by the walking and running mode of progress rather than by the arboreal mode, a stock in which alertness and intelligence were at a premium in the open or partly forested country.

A few years ago, when discoveries in western Europe crowded fast upon each other, when the Piltdown man and shortly after the Foxhall man were found in Great Britain, the pendulum of anthropologic opinion swung toward Europe as the possible dispersal centre of the human race. I never favored this theory, because we have every reason to believe that western Europe was a lowland, either partly or heavily forested. Then Matthew and myself independently advocated the high central Asia origin of the human stock—a

plateau partly forest region capable of stimulating all the intelligence of primitive mankind. The very latest discovery by the Central Asiatic Expeditions of the American Museum of Natural History is extensive flint culture in the very heart of the Gobi Desert. This culture belongs to the close of the Stone Age, corresponding with the Azilian of France and, taken together with the neanderthaloid culture of the Ordos in northern China, tends strongly to reaffirm the older theory that Asia is the chief home of the human race.

Every great anthropologic and palæontologic discovery fits into its proper place, enabling us gradually to fill out one after another the great branching lines of human ascent and to connect with these branches definite phases of industry and of art. This gives us a double means of interpretation, archæological and anatomical. While many branches and links in the chain remain to be discovered, we are now in a position to predict with great confidence not only what these various branches will be like but where they are most likely to be found.

VIII

HOW TO TEACH EVOLUTION IN
THE SCHOOLS

The Bryan fundamentalist movement did not concern the scientific and educational standards of America in the least so long as the movement kept within its own bounds. But we educators were suddenly awakened to the fact that from small and unthreatening beginnings the movement had increased in broadness and aggressiveness until it aimed at our very Constitution of learning in the United States, which guarantees to education entire freedom from religious or sectarian control. Among our deepest instincts, scientific and political, are non-interference by educators with any of the doctrines or dogmas, however extreme or even absurd, of the three hundred and fifty or more bodies of believers into which our religious communities are divided, and, on the other hand, non-interference by these religious bodies with the teaching in our schools of well-established truths.

HOW TO TEACH EVOLUTION IN THE SCHOOLS

Need of well-trained teachers — The author's fiftieth anniversary as a teacher — Meaning of the word "evolution" — Distinction between opinion and fact — The natural gradation in teaching evolution — The inspiration of the object — The modern opportunities of Nature-study — The beginnings of evolutionary teaching.

EVOLUTION, while a well-established truth of Nature, as a teaching subject is like an explosive weapon, likely to go off and do a great deal of harm. For this reason it should be presented only by well-trained teachers who thoroughly understand the subject, who clearly distinguish between fact and opinion, and who realize that the strong meat of science is not for babes but for adults. To secure such well-equipped teachers, to put the teaching profession back where it was fifty years ago as the leading profession in the welfare and progress of the country, the most important thing in American life today is to double the allowance for education in almost

every State in the Union, especially in the eastern States, where the cost of living is highest. By recent report, New York City gives 16 per cent of its total income to education, whereas the city of Los Angeles gives 60 per cent of its total income. Under present salary conditions it is absolutely impossible to recruit the ablest and best teachers for the cause of education in its broadest sense, spiritual, intellectual, moral, and physical. On the whole, the present teaching class is conscientious, high-minded, and unselfish, but, in general, is unprepared either by observation or experience in many of the subjects it undertakes to teach.

This ignorance, especially in the subjects of the newer scientific fields of biology and geology, was startlingly displayed, to the amazement of the whole world, in the now famous Scopes case. This case suddenly revealed throughout large sections of the United States absolutely dense, almost mediæval ignorance of the simplest and most beneficent teachings of Nature and showed a fanatical determination to suppress these teachings in the schools,

under the wholly misguided conviction that they are necessarily hostile to religion and morals. Such a state of mind, recurring again and again in the history of civilization, has profoundly affected education from top to bottom, from the highest rulers to the lowest subjects, but we did not suspect it would ever occur with us in the present civilization of the United States. In the Tennessee case, the governor, the legislators, the courts, and the majority of the people, including certain of the teaching class, while animated by the highest motives, were pursuing a course quite fatal both to religion and morals. No code of morals, however Draconian, can stand up against the laws of Nature. Bryan and the fundamentalists remind us of King Canute and his courtiers enthroned by the seashore, commanding the waves of Truth to recede.

FIFTIETH ANNIVERSARY AS A TEACHER

In a few months I am celebrating the semi-centennial of my career as a teacher, and I may give a few words of personal experience bearing on the direct inspiration of Nature.

In 1876, under an impulse wholly from within, I began to observe the lessons of geology. Three friends joined me in a country-wide tour with an old horse and old wagon that had been used as a chicken roost. We journeyed through the highlands of the Hudson and through the Catskill Mountains to the limestone caves on the westerly slope, geologizing in the most rudimentary manner as we went along. We observed and collected the Palæozoic fossils along the roadways, and then tried to identify them from Dana's "Manual of Geology." This expedition of 1876 so fascinated us that in 1877 we planned one into the Rocky Mountains, and thereby gained the training for explorations which have extended entirely around the world, ending in Mongolia, the roof of the world, the centre of the life of mammals, and perhaps the homeland of man himself.

The footprints of evolution observed in the Catskills and Rockies led me to search for footprints in practically every State of the Union, in England, France, and Germany, in northern Africa, and, finally, in China and

Mongolia. Thus through direct observation in every continent was the principle of evolution impressed on my mind as the universal and only method of creation, mysterious, purposive, beautiful, as are all the laws of Nature.

In recalling fifty years' enrolment in the great University of Nature, and where it has led me, I am often reminded of the closing lines of Goethe's "Wilhelm Meister's Wanderjahre":

Bleibe nicht am Boden heften
Frisch gewagt und frisch hinaus!
Kopf und Arm, mit heitern Kräften
Ueberall bin ich zu Haus;
Wo wir uns der Sonne freuen,
Sind wir jede Sorge los;
Dass wir uns in ihr zerstreuen
Darum ist die Welt so gross.

As one sequel to this first Nature course entered upon by Scott and myself, Princeton juniors, it may interest you to know that both of us have been awarded the Wollaston Medal, the highest honor in the gift of the Geological Society of London. Scott is now the distinguished Blair Professor of Geology and

Palæontology in Princeton University, retired president of the American Philosophical Society, and recipient of the Hayden Medal of the Philadelphia Academy of Natural Sciences; with my own career you are probably familiar.

MEANING OF THE WORD EVOLUTION

It is singular that the word evolution,¹ which is our feeble human symbol for the divine order of Nature, should be so misunderstood and misinterpreted in State after State of our Union, and that effort after effort has been made to make it an outcast and pariah in education. Yet it is a fact that in many parts of the United States the attempt is being made to suppress the teaching of evolution in our public schools, on the ground that it is harmful to the conduct, morals, and religion of our youth.

¹ Evolution (Latin *evolutio*, an unrolling or opening [of a book], < *evolutus*, p.p. of *evolvere*, unroll, unfold >). The act or process of unfolding, or the state of being unfolded; an opening out or unrolling.

"Evolution or development is, in fact, at present employed in biology as a general name for the history of the steps by which any living being has acquired the morphological and physiological characters which distinguish it." ("Evolution in Biology," Huxley.)

DISTINCTION BETWEEN OPINION AND FACT

I regret to say that some teachers do not distinguish between *opinion* and *truth*; they even pass backward and forward from truth to opinion, and from opinion to truth without being conscious of their own vacillation. One rule I have invariably made with my classes is to stamp the word *opinion* on every hypothesis or theory, and the word *fact* on every established principle or law.

My connection with the Scopes case bears out my conviction that sincerity and truthfulness are the very heart-blood of education. No teacher should be forced to dissemble or to be insincere in expressing his real beliefs of scientific truths; he may rightly be forced to express his beliefs in a tactful manner, so that without dissembling he may not repudiate them. To my mind insincerity, lack of truthfulness and dissembling of real beliefs are vital defects in a teacher which may ultimately destroy his entire usefulness, the rift in the lute which, ever widening, finally makes the music mute. Scholastic and academic

freedom in the expression of natural *truth* is as imperative as is scholastic and academic *caution* in the expression of personal *opinion*.

THE NATURAL GRADATION IN TEACHING EVOLUTION

According to the above principle, the teaching of evolution should advance gradually, step by step, with the development of the mind, of the character, and of the maturity of the student. For example, only mature students are capable of understanding the very perplexing differences between different theories of evolution, such as those of Lamarck, of Darwin and Wallace, of Herbert Spencer and Cope, of Weismann, DeVries, and Mendel. Moreover, the very words "Darwinism," "Lamarckism," and "Mendelism" are incrustated with human opinions, discussions, controversies, and philosophical and theological disputes which have no place in the school curriculum, and are difficult to master even in the advanced years of college and university life.

Consequently, Darwin should be mentioned

purely as a naturalist from his earliest years, as a voyager on the *Beagle*, as a close observer of rocks, flowers, plants, and animals, and, finally, as an exponent of the principle of evolution and originator of the great idea that the struggle for existence and the survival of the fittest have played a large part in making plants and animals and man himself what they are. The story of the youthful Darwin with the beetle in his mouth may be as potent for natural history as the story of Washington and the cherry-tree has been for statesmanship; or we may tell the story of the Abbot of Brünn, Gregor Mendel (1822-84), who in his cloister garden made his great discovery about heredity in his observations of the edible pea (*Pisum sativum*).

For younger minds we should strip science of the elements of human error clothing it, and present Nature face to face, in its simple forms and its simple truthfulness. We need not teach evolution involved in human fallibility, as Haeckel taught it in his now outworn "Anthropogenie," but as Darwin taught it in his "Voyage of the Beagle" and as Lyell

taught it in his "Elements of Geology." Thus, while at first avoiding, if needs be, the use of the word "evolution" and stepping aside from any theory of evolution (since both word and theory are of human origin), we may present to the most tender minds the real essentials of the evolution process, namely, of the adaptations to be found in every plant and animal we study, and which may be explained without involving even a shade of our scientific philosophy. Thus the real significance of the law of evolution is gradually made clear before the largely misunderstood word itself is used, and long before the student approaches philosophy or metaphysics.

The moral lessons which may be instilled in this manner are countless, for the word "evolution" is merely a human expression for ascent rather than descent, for progress rather than retrogression, for effort and endeavor rather than for indolence and idleness, for the overcoming of difficulties and obstacles, for the greater ultimate reward in the mastery of self, for adaptation to the changes and chances of this mortal life.

THE INSPIRATION OF THE OBJECT

Gradus ad Parnassum, the watchword of evolution, is also the watchword of the teacher's life. The task of the teacher of the principles of evolution is far from an easy one. The teacher may appeal to the inspiration of the object, of which I could give you many illustrations. My biology started with the original study of a hen's egg; Beebe was set in motion by the bird; McClure started with the brain of a sheep. There is no telling what latent powers the observation of a single natural object may evoke.

I discovered for myself that the easiest lines of instruction are those which a university specialist and investigator may give to the most advanced students in university courses, where larger knowledge may be taken for granted, where professional training is in view, and where the teacher does not have to stop to explain details.

Then there is the college grade of student, with whom inspiration is the larger part of the teacher's battle; the teacher cannot inspire

if he has not a burning enthusiasm of his own on the subject to impart—he loses the battle at the outset, for the college student is a capricious animal subject to a hundred different tastes and impulses, and his interest and attention must be won over.

The teacher has to make his own subject more interesting and inspiring than athletics or dramatics or any of the so-called extracurricular activities of college life. I know this can be done, for I did it myself in my ten years' professorate at Princeton, in which I never took an absence roll because it was never necessary. From my Princeton and Columbia laboratories and lecture-rooms between 1880 and 1908 went forth sixty-eight explorers, investigators, professors, and authors, including many men now of international reputation. Teacher after teacher has conquered, so let only the dullard teacher complain that this battle of the inspiration of the subject cannot be won. The same ordeal of the inspiration of the subject and of magnetic personality awaits the teacher in the high school and in the secondary school, where, al-

though supported by the compulsory drill element of school life, he must make his subject more interesting than any other.

It is on this point of inspiration that the teacher of evolution as biology has a natural advantage over all his colleagues, for what branch of science is so interesting and fascinating as life itself? I have this opinion from two of the most eminent physicists in the country, Michael I. Pupin, of Columbia, and George Ellery Hale, of Mount Wilson Observatory. What secrets compare with the secrets of the flowers, of the plants, of the animals, of human life and progress?—for in its real significance this is what evolution means: it is progress, it is advance, it is continuous uplift and improvement, it is a constantly creative adaptation to new and often trying conditions of life. Were it not for human evolution—that is, for human progress—the beautiful buildings in which we assemble would not exist; we would still be meeting in a smoky cavern or exposed to the fierce winds of a drifting river valley, as were our ancestors of long ago. Were it not for human evolution and the prog-

ress of our minds and souls there would be no association of teachers of colleges and secondary schools, there would be no Columbia, Harvard, or any other university, there would be no city of New York, there would be no free United States of America, there would be no civilization anywhere, because only through this all-beneficent principle of evolution are we here, with all our human limitations and defects, ever battling for the future, that our America at least shall never stem the upward and onward march of humanity.

THE MODERN OPPORTUNITIES OF NATURE- STUDY

Such a programme for the teaching of evolution involves two absolutely essential elements: first, a natural gift for teaching; second, personal training through direct observation of the process of evolution. To my knowledge, there is not a single existing text- or reference-book in the English language which clearly presents the whole process of evolution, although there are many extremely valuable books in which the five chief prin-

ciples of adaptation, of development and regeneration, of sacrifice and compensation, of the struggle for existence and survival of the fittest are clearly set forth.

Fortunately, the modern teacher has opportunities unknown a generation ago, namely, in the admirable guides to Nature-study in all its branches, in the wonderful seashore and land laboratories, in the great museums of natural history springing up in most of our cities, and in the new "nature trails" like that recently established by Doctor Frank H. Lutz in our New York State Park. Nothing can take the place of preparation for the teaching of evolution through direct personal observation and reflection and, perhaps, discovery by the teacher himself or herself.

THE BEGINNINGS OF EVOLUTIONARY TEACHING

The quiet, unseen, and continuous ascent and adaptation of life to new conditions is the nobler and more spiritual side of evolution, and it is the very first principle that should be taught. It should at first be taught only

from Nature itself, under the apprenticeship of the sympathetic and skilful teacher; it should *not* at once be taught from Darwin or Wallace, from Haeckel or Herbert Spencer, or even from the more modern Mendel and Weismann. Following direct observations of Nature under the teacher's guidance there should be brief and simple lessons and verifications from books.

The young student need not concern himself about age-long controversies between science and theology, because these man-made disputations lie entirely outside the chief field of evolutionary teaching in the schools, and belong only in the advanced college and university grade.

Consistent with my own observations on the child mind and the child nature is my attitude on the question immediately before us, namely, how to teach evolution in the schools. The very first maxim is that evolution should be taught in such a way as to exalt and beautify the entire conception of life rather than to debase or materialize it; it should be taught in such a way as to satisfy instinctive

curiosity about the workings of Nature, to answer the simple and innocent inquiries that arise in the young mind—in brief, to inspire youth with the truth and beauty of Nature, not to debase youth with the alloy of the mechanical, commercial, or sensual side of life or to falsify evolution as a gospel of negation rather than to dignify it as a gospel of inspiration.

Among the fundamental principles of evolution which completely baffle our understanding are illustrations and examples which are easily brought within reach of the child mind and of the school mind of all grades. I refer first to adaptation—the fitness of means to ends—as observed in plants and animals; adaptation is at once the simplest and most obvious gateway of evolutionary knowledge and experience. The second step is to show that adaptation or fitness is invariably brought about by sacrifice, through the loss of less important structures and organs, to offset the gain of the more important, as illustrated in plants and animals, or, where these are not accessible, in the human body,

limbs, hands, and feet. For example, the hand of the teacher, with simple models and diagrams of the foot of the ancestral four-toed horse and of the modern single-toed horse, may make perfectly clear the first three processes of adaptation, of sacrifice and compensation, and of correlative use, development, and progress, or of correlative dis-use, degeneration, and retrogression. Add to these simple and easily explained processes the idea of the struggle for existence and survival of the fittest and you have the whole framework of evolution as it was known to Aristotle and Darwin, the greatest biological minds of all time.

This kind of evolution teaching is inspiring and uplifting; it embodies the creed of evolution which I first set forth to Bryan in my "Evolution and Religion":

The moral principle inherent in evolution is that nothing can be gained in this world without an effort; the ethical principle inherent in evolution is that only the best has the right to survive; the spiritual principle in evolution is the dominance of beauty, of order, and of design in the daily myriad of miracles to which we owe our existence.

Not for a moment would I substitute such a creed for the Ten Commandments, for the Lord's Prayer or for the Sermon on the Mount, but when puzzling philosophic questions difficult for the teacher to answer begin to be asked in the high school or college stage of instruction, it may be pointed out step by step, as in the chapter "Evolution and Daily Living," that Nature never relaxes but always reinforces moral and spiritual laws, that Nature may forgive but never forgets—in other words, that there can be no contradiction or conflict between Nature and religion, because primitive religion issues out of the heart of Nature in reverence for the powers of the unseen.

IX

HOW TO RESTORE RELIGION TO
THE SCHOOLS

Will Religion or Science control the future of mankind? This was the question discussed before the members of the National Republican Club on January 23, 1926. Among the well-known speakers were Mr. Fred B. Smith of the International Y. M. C. A., Reverend Minot Simons, Unitarian minister, Doctor P. W. Kuo, Chinese educator, Reverend S. Parkes Cadman, President of the Federal Council of Churches, and Professor Henry Fairfield Osborn, scientist. Perhaps a debate was anticipated in the choice of speakers, but the discussion proved to be entirely harmonious. The views of Doctor Cadman largely coincided with those expressed in the present article.

The question of the restoration of the teaching of religion in the schools was much more violently debated a few days later before the Board of Education of the City of New York. The proposal to introduce the Ten Commandments and simple religious doctrines such as those advocated in this chapter led to a very heated discussion between representatives of the Protestant, Hebrew, and Roman Catholic communions. This meeting apparently proved that the hope of agreement on any form of religious teaching in the much-divided religious community of New York is entirely visionary.

HOW TO RESTORE RELIGION TO THE SCHOOLS

A simplified religion and a reverent science — Religion or Science alone fails — The scientific experiment in Russia — The teaching of the universal elements of religion — The respective gifts of the Hebrews and of the Christians — The historic elements of religion — Governors of morals in the daily press — Power of the headliner.

IN my opinion religion and science will unite to control the future of mankind. This will be a simplified religion and a reverent science.

RELIGION OR SCIENCE ALONE FAILS

Religion alone has signally failed to control mankind in the past, either because it has ignored the teachings of Nature, from which in itself religion is primarily derived, or because it has allied itself with temporal or political power, which the founders of every great system of religion, except the Mohammedan, expressly repudiate. Religion alone failed to avert plague, pestilence, and famine, which

paralyzed the armies of the wisest statesmen from the time of Moses to that of the discovery of vaccine by Jenner. Religion alone laid down great social and humanitarian precepts which, all-wise and all-provident in their day of small populations and of vast territories and unknown seas to conquer, are neither wise nor beneficent in our day of an earth teeming to the saturation-point with people. "Be fruitful and multiply," was a beautiful religious sentiment in the day of Moses, but to-day science compels us to restate it in terms like these: "Be fruitful and multiply if your offspring will be a blessing rather than a curse to themselves and to the society into which they are born." So with many another precept, wise in pastoral days, unwise in our crowded age.

Science alone could control the future of mankind unaided, if men and women and children were mere machines. We could more than justify Osler's great expression, "Man's redemption of man," if men were merely a compound of matter and energy, of actions and reactions between molecules, atoms, and

electrons. Largely inspired by men of deep religious motive, like Jenner and Pasteur, science has indeed redeemed the body of man, and has shown the way to its final and absolute physical redemption through the conquest of all plagues, pestilences, and famines; the most solemn words of the Litany may be rewritten as follows: "From ignorance of the causes of plague, pestilence, and famine, good Lord, deliver us."

THE SCIENTIFIC EXPERIMENT IN RUSSIA

In one of the great states of the world, Russia, the experiment is being made on a colossal scale to rule mankind by science alone, on a platform of atheism, of denial of all religious restraints and prohibitions, and of affirmation of atheism. This experiment, too, might be successful if the at once spirited and docile Russian people were mere machines, but unprejudiced scientific research and unprejudiced religious, as distinguished from theological, research reveals that these peasants are much more than machines; their bodies are easy to account for by evolution, their spirits and souls

can be accounted for only through very long, continuous upward progress, closely akin to creation.

The existence of this human spirit, which religious-minded people call the soul, is an undeniable fact alike in science and in religion, entirely apart from the theologic question of the origin of the soul and of its immortality. It is a fact which every State has to reckon with, whether it be Russia or the United States of America, that human government is not a government of machines, but of minds and spirits.

Consequently, as a devotee of science I reach the point that religion must also control the future of mankind, a religion purified and simplified by our knowledge of Nature. For this reason it is the first concern of statesmen to recognize that in the future these forces must go hand in hand, that education in true religion is no less vital than education in the laws of Nature. It is very significant that the very opening sentence of Lincoln's first public speech was that education is the first and most important duty of the State.

THE TEACHING OF THE UNIVERSAL
ELEMENTS OF RELIGION

So I am a strong advocate of restoring the teaching of religion to our public schools, religion of the kind which has been abolished because of purely theologic differences, not because of its inherent lack of force in education. As a man of science I am not tongue-tied by adherence to any denomination, creed, or dogma; I am free to speak from the scientific standpoint whatever may be my personal opinions and principles. I should like to see all the religious men of this great city of 6,000,000 souls, of this great country of a 100,000,000 souls, get together and agree upon a simple, elemental, and more or less primeval teaching of religion, in which all men, except those who persuade themselves that they are atheists, agree.

GIFTS OF THE HEBREWS AND CHRISTIANS

The Hebrews have a rich gift to offer in the Ten Commandments, which no man can refuse. Why not brand upon the minds and

hearts of our boys and girls such elemental imperatives as "Thou shalt not kill," "Thou shalt not steal," "Thou shalt not commit adultery," "Thou shalt not bear false witness"—imperatives of all human experience. Let the Old Testament contribute great adages on the training of youth, on youthful friendship, on family devotion, on loyalty to the State, on purity of living—adages which are built into the very foundations of the Republic. Let the Christians contribute the Lord's Prayer, in which in a few words all religion is summed up, the Sermon on the Mount, adapted to the pastoral or village life of man, or passages from the teachings of St. Paul and other missionaries, perfectly adapted to the virtues and vices, the strivings and failures, of a municipal life like ours.

HISTORIC ELEMENTS OF RELIGION

These historic elements of religion, carved out of thousands of years of hard human experience, are easily impressed on the hearts and minds of the young; they teach the young soul to recoil with abhorrence from the deeds

which are lightly headlined in our daily press, lightly treated on the stage and in the movies, as if they were of the very smallest, instead of the very greatest, concern to the future of mankind.

GOVERNORS OF MORALS IN THE DAILY
PRESS

Time was when chiefs, princes, and kings governed great states by their laws and edicts as both nominal and real governors; these were the days of aristocracy. Democracy has changed all this, and it would be hard to discover who are the real governors in this human maelstrom of ours. Wise and great and religious as may be our elective presidents, our State governors, our mayors, their powers are certainly more nominal than real, for democracy has thrown real government into the hands of the newspaper press and of the managers of the theatres and movie houses. What avails the temperance or the piety of a Coolidge, a Smith, a Walker, if prohibition is laughed off the stage, if the stage clergymen appear as shambling hypocrites, if boys and

girls are fed on the irreverence of the funny page, if Chaplin in two of his most successful pieces shows the happy ending of the life of a cunning thief, if the virtuous woman is made unattractive and the scarlet woman the heroine, if one newspaper column makes a prize-fighter the lion of the day and the next column euphemistically describes a murderer as a bandit.

POWER OF THE HEADLINER

After several years of scientific exploration and research in trying to discover our real governor of morals, I am for the time confident that he is the "headliner" of the daily press, the only man in the community that we are all afraid of! I recently delivered at New Haven a perfectly innocent address on the Origin of Species; in it there was not a word about religion, but when it bore the headliner's imprint it appeared in all parts of the United States as "Osborn Raps Traditional Theology," or "Osborn Declares Science and Religion Irreconcilable." With such transcendent power to transform a single

speech, may we not quote from Senator Ingalls's classic sonnet in characterization of the "headliner":

Master of human destinies am I!
Fame, love, and fortune on my footsteps wait.

.
. . . It is the hour of fate,
And they who follow me reach every state
Mortals desire. . . .

These swaying moral currents of the streets, of the daily press, of the stage, of the movies, are the real, actual, educational forces controlling the present youth and, consequently, the future of mankind. In the words of Calvin Coolidge, they must be offset by a reverence for Nature, a reverence for law and for the spiritual forces of true religion. To face the future of mankind, therefore, a simplified religion must join hands with a reverent science.

X

CONVINCING EVIDENCE OF THE
GEOLOGIC ANTIQUITY OF MAN

This address, delivered to the students of Cornell University on February 19, 1926, is in reply to "Mr. Bryan Speaks to Darwin," published in the *Forum*, July, 1925, the last article of my opponent, in which he sweeps aside all the existing evidence for the evolution of man and with good-natured raillery shows upon what apparently slender threads certain of this evidence depends. The Nebraska tooth, *Hesperopithecus*, supposedly belonging to the first anthropoid ape to reach America, becomes a special target, and indeed constitutes the kind of evidence which is disputed even among scientific men.

"Fancies of the Evolutionists" was the title of an article in the February, 1926, *Forum*, in which Doctor John Roach Straton issued a further challenge to the reliability of the evidence contained in the American Museum of Natural History exhibition hall known as the "Age of Man." Accordingly, in this chapter there is again set forth convincing evidence of the geologic antiquity and creative evolution of man and the newer evidence that man belongs to a family of his own, entirely independent of the ape family. Of special significance are the great contributions of scholars and divines of the Roman Catholic Church to our knowledge of the prehistory of man.

CONVINCING EVIDENCE OF THE GEOLOGIC ANTIQUITY OF MAN

Man on the earth 500,000 years — 130 years of research — Significant bits of fossil evidence — Reluctant acceptance of new facts — No conspiracy of science — Man a family independent of the apes — Scholarship of the French clergy — Dispersal and branching of the human family — We cannot excommunicate our ancestors.

THE purpose of this article is not to reply to the recent attacks upon my scientific character and integrity, but to set forth clearly the rapidly accumulating evidence of the geologic antiquity and creative evolution of man. The outstanding irrefutable facts are the following: First, that man with a human form and human attributes has been on the earth over 500,000 years, according to the least estimates of geologic time. Second, that man belongs to a family of his own, called the *Hominidæ*, which has a history entirely independent of all other families for an incalculable period of time—two and a half millions of years at the least geologic estimate. Third,

that this human and prehuman family, composed of the existing and prehistoric races of man, has from the first divided into many branches more or less rapidly progressive and intelligent. Fourth, that we have indisputable records of the early dispersal of these branches in central, southern, and eastern Asia, in all except the northern parts of Europe, in the British Isles. Fifth, that our present knowledge both of the anatomical characters and of the cultural unity of even the earliest known branches of the human race points to descent from a single geologically remote human stock, the blood and heritage from which constitute a prehistoric brotherhood of man. Sixth, that convincing evidence of these outstanding facts of early human history rests, first, on the indestructible flint and stone industry interpreted; second, upon absolutely consistent anatomical evidence clearly interpreted by four generations of expert and conscientious observers drawn from the ranks of laymen, of learned professions, and of the clergy, especially of the Roman Catholic Church.

ONE HUNDRED AND THIRTY YEARS OF
RESEARCH

From this it follows that our present knowledge of the prehistory of man rests upon 130 years of extremely difficult and often baffling research. The Hall of the Age of Man in the American Museum of Natural History presents an epitome of this long voyage into the unknown, and an assemblage of all the positive facts established by discoveries in all parts of the world, which give us flashes of the truth. The very arrangement of this exhibition has cost ten years of continuous effort; repeated journeys to Europe to verify the documents of human prehistory at first hand; strong persuasion to secure casts and other replicas of original materials so unique and precious that they are hoarded in safes like the holy relics of certain of the saints; international and scientific pressure to examine certain materials jealously guarded even from scientific view by their owners; profound and painstaking independent researches on the foot, on the jaw, on the skull, on the teeth,

of such character that a single fragment may tell a story as conclusive as the cuneiform inscriptions on a Babylonian cylinder.

SIGNIFICANT BITS OF FOSSIL EVIDENCE

To the well-intentioned but unenlightened mind this century and a half of world-wide search for the fossil remains of man and of his animal contemporaries, as well as the days and nights of self-denying labor directed to the decipherment of these baffling cuneiform inscriptions of human history, these Rosetta Stones of antiquity, mean absolutely nothing. To such a mind a half cranium like that discovered in the gravels of Piltdown or in the river sands of Trinil, Java, is merely a bit of shattered bone to be thrown aside as worthless or irrelevant. But to the human and comparative neurologist who is devoting an entire lifetime to the study of the human brain, this fragment of bone reveals, through a cast of its inner surface, the entire anatomy of the brain, its approximate capacity, the configuration of its convolutions, the courses of the arteries and veins which traverse its surface, the propor-

tions of its various parts, the relative development of those areas which control the movements of the hands and limbs, of other areas in which lie the higher centres of idealism and of imagination, and of still other centres which in the human brain control the faculty of speech. Thus the brain casts of the Trinil, of the Piltdown, of the Neanderthal man, when examined by methods slowly developed by man through centuries of research, extending back to the times of Galen and of Æsculapius, are by no means blurred or indecipherable documents like the palimpsests of many sacred writings, but are absolutely unchallengeable records as clear as daylight to the man who has learned how to read them, although absolutely baffling and confusing to the unenlightened.

NO CONSPIRACY OF SCIENCE; RELUCTANT
ACCEPTANCE OF NEW FACTS

Nor has there been any conspiracy either of silence or of scientific prejudice, in the original significance of the word *præjudicium*, in forming advance or biassed judgments or of inclining to observe certain facts which further a

preconceived theory and to ignore other facts. On the contrary, every one of these fossil documents of human history has passed through a double baptism: First, the wide-spread human inertia and reluctance to incorporate a new idea, a reluctance shared both by the laity and the clergy; second, wide-spread reluctance on the part of a majority of scientific men to accept discoveries made by other scientific men—witness the tardy acceptance of the first discovery of Neanderthal man, its rejection even by Darwin and by the master anatomist Huxley, its long battle for scientific recognition which came finally in the discovery of remains of an exactly similar human skull-top at Spy, Belgium. Even after Spy there were scientific doubting Thomases who declared that complete skeletons must be secured. Finally a complete skeleton was found—the most perfectly preserved Neanderthaloid known—at La Chapelle-aux-Saints, by the Abbés A. and J. Bouysonnie and L. Bardon, and other skeletons were found at various sites.

But still there remain the doubting Thomases who will not allow us to reconstruct

Neanderthal man, although we know every bit of his bony anatomy, and every corner of the surface of his brain. Exactly so with the Piltdown man discovered and worked out through a decade of unparalleled labor by Sir Arthur Smith Woodward of the British Museum; in all the annals of human scientific endeavor there is no parallel to the persistence, patience, and conscientiousness of this palæontologist who, day after day, week after week, month after month, year after year, minutely examined these most baffling Piltdown gravels in search of additional fragments of the Piltdown head in order to verify his original statement that the chimpanzee-like jaw belonged with the thoroughly human cranium. Nor was he encouraged by a chorus of praise from his fellow anatomists; on the other hand, he met every possible discouragement on the part of the scientific men. My own scepticism in the matter very nearly cost me my lifelong friendship with him, because he felt very much hurt by it. Now when he visits the excavation in the Piltdown gravels where he worked for ten years he points with

satisfaction to the very spot where Osborn stood when he recanted, and finally admitted that the chimpanzee-like jaw belonged with the human skull !

MAN A FAMILY INDEPENDENT OF THE APES

There has been even less conspiracy of science in favor of any given theory in the case of the Trinil race. A skull-cap and thigh-bone discovered in Java in 1891 received a name signifying "ape-like man" from Professor Eugen Dubois of the University of Amsterdam; this announcement was received with a storm of incredulity and few expressions of approval; the bony relics were locked up in the professor's cabinet, and no one was allowed to see them; beautifully prepared plates were not published. Finally the writer took the matter up with the Dutch Academy of Science and with the Minister of the Netherlands at Washington as a source of international regret that these human documents should not be opened to further research; and at last Doctor Dubois sent a cordial invitation to the American Museum of Natural History

to participate in original research, promising a beautiful series of casts made under his direction and reserving for himself only the study of the femur, on the characters of which was based his deduction that the Trinil ape-man stood erect. Professor McGregor of Columbia University, one of the most conscientious and painstaking anatomists in the world to-day, was sent out by the American Museum on this invitation; he rendered a report of convincing accuracy: First, that the Trinil race belongs in the family of man (*Hominidæ*) and not in the family of apes (*Simiidæ*); second, and most significant, that the brain capacity is greater than Doctor Dubois at first supposed, namely, 940 cubic centimetres, and consequently is not only much larger and more indicative of intelligence than that of any anthropoid ape, but lies above the limit of the most primitive human types—930 cubic centimetres. Thus the Trinil race, after many hardships and vicissitudes, comes into its own; it is a veritable “missing link.”

Connected with the Trinil man is one of the outstanding discoveries of the last decade,

namely, that man has a long and noble ancestry of his own, extending back into the "corridors of time" so remotely that we need not in the least concern ourselves about the anatomical resemblance and similar blood reactions which connect us on the one hand with the higher anthropoid apes and on the other with the lower monkeys. This ancestral chain of human distinctness is hundreds of millenniums in length; the 500,000 years of the Age of Man which separate us from our human ancestors of the Foxhall race of Norfolk, England, are only a fragment of the whole period of time. It may be confidently asserted that for a period of at least 2,000,000 years man has constituted a separate family.

SCHOLARSHIP OF THE FRENCH CLERGY

But we must return for the moment to our chief subject—the authenticity of the documents of human prehistory and the great scholars to whom they owe their decipherment. Among these scholars whose names adorn the honor-roll of anthropology in France, none is more illustrious than the long

line of Catholic priests and abbés whose researches and scholarship have notably added to our knowledge of fossil man. This tribute is so important at the present time, when human evolution is before us as an alleged but not real enemy of religion, that we deem it worthy of presentation in some historic detail.

The Abbé Louis Bourgeois (1819–1878) rector of the seminary of Pontlevoy, Loire-et-Cher, was the first to present and develop the problem of the eoliths in 1863. He discovered near Thenay in fresh-water deposits of the Upper Oligocene a great quantity of “flints shaped by human agency”; on these grounds he supported the idea of human beings already living during the Age of Mammals pursuing an industry in stone implements that had attained considerable development, and already acquainted with the use of fire. The Abbé Delaunay collaborated with him in these researches.

The Abbé Ducrost, in collaboration with Doctor Lartet, published in 1872 in the *Archives du Musée d'Histoire Naturelle de Lyon* the results of the excavations of the station of

Solutré, in which he had participated with the discoverer of the site, Doctor Adrien Arcelin, and H. de Ferry. The Abbé Ducrost continued these investigations up to his death. A sensational discovery which he considered of greatest importance was "a sepulture surrounded by great blocks of stone arranged in a sort of large oval, in the middle of which was a human skeleton with typical Solutrean leaf-points, a figurine (reindeer) carved in soft stone, fossilized reindeer bones, etc." This sepulture, discovered and reported by the abbé in 1868, and considered by him to be dated beyond question, has unfortunately been lost trace of.

The great explorations of the Prince of Monaco at the Grottes de Grimaldi were carried out by Doctor Marcelin Boule, Professor Emile Cartailhac, Doctor René Verneau, and the Chanoine de Villeneuve, and the results were published in 1906. At this site were found the remains of at least seventeen individuals and a number of human sepultures which were associated with implements of Aurignacian type.

It required the coöperation of three enlightened French priests to reëstablish and complete our knowledge of the Neanderthal race, namely, the two brothers, the Abbé A. Bouyssonie and the Abbé J. Bouyssonie, and their friend, the Abbé Bardon. These three friends discovered on August 3, 1908, in the small low cave of La Bouffis Bonneval, near La Chapelle-aux-Saints, the most perfect skeleton known of the neanderthaloid race, excavating it from an undisturbed deposit containing Mousterian flint implements, shells, and remains of woolly rhinoceros, horse, reindeer, and bison. In the published account of their discovery they attributed the human skeleton to the Neanderthal race, which judgment was later confirmed by Doctor Marcelin Boule after exhaustive study of the specimen.

Padre Lorenzo Sierra is a distinguished Spanish archæologist, noted for his discoveries of Palæolithic caves in the Cantabrian Mountains of northern Spain.

We now reach the names of the two most distinguished men to-day in the prehistoric archæology of Europe, the Abbé Henri Breuil,

assistant director of the great Institut de Paléontologie Humaine in Paris, and the Abbé Hugo Obermaier, professor of human prehistory in the University of Madrid. To the former we chiefly owe the masterly volumes covering the industries, paintings, and sculptures of the Upper Palæolithic period in France, culminating in the zenith of Magdalenian art; to the latter we owe the most extensive explorations in Spain and in France of the whole period of human occupation, which culminated in his volume, "El Hombre Fósil," published in Madrid (second edition, 1925) and translated by the Hispanic Society of America as "Fossil Man in Spain."

This brings us to the most recent phase of human prehistory, namely, tracing man back to his ancient home—not in Mesopotamia or near Mount Ararat, but in the high central plateaus of northern China and Mongolia. The first step in this direction was taken by Père Licent, a Jesuit missionary, who discovered the flints of Ordos; the second step was taken by Père Teilhard de Chardin, professor of geology in the Institut Catholique de

Paris, who in 1923 discovered at sites in China and Mongolia human industrial remains, together with fossilized bones of animals, many of which are extinct.

The writer has had the privilege of personal association with several of these distinguished French archæologists of the Catholic faith: with the Abbé Hugo Obermaier in an ever-memorable journey through the prehistoric monuments of northern Spain; with the Abbé Henri Breuil into the recesses of all the principal prehistoric caverns of France—the archæologist who begins his day in his abbé's dress in religious devotions, and then dons his rude miner's costume and lamp for descent into the often perilous recesses of the caverns.

DISPERSAL AND BRANCHING OF THE HUMAN FAMILY

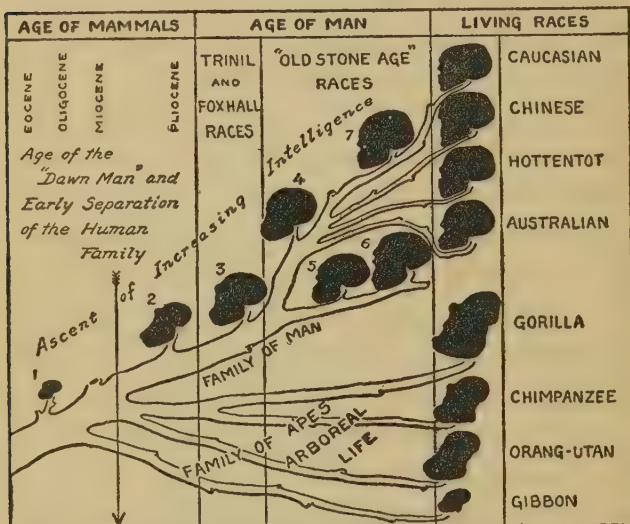
The second great generalization following that of the almost unimaginable antiquity of the human family is that this family has spread from a possible centre in central Asia southward into southern Asia and the East Indies, westward into western Asia and Eu-

rope, dividing into several distinct branches which more or less rapidly diverged from each other, which became more or less progressive and intelligent according to the demands made upon them by their environment and life-habits, and which consequently retained more or less of that extremely remote ancestral form which links man with the other primates. Apart from the theoretic existence of many human and prehuman branches arising in the struggle for existence in different parts of the vast region from the Island of Java in the southeast to the Island of Britain in the northwest, we have human and prehuman documents which afford incontestable proofs of this branching and divergent nature of human origin. It is true that these documents are extremely rare, but it is also true that they in each case consist of the very parts of the skeleton which yield the most convincing testimony. Thus while the protruding eye-ridges of the Trinil man remind us of the beetling brows of certain of the anthropoid apes, the large and relatively well-developed brain tells a different story.

So with the few relics of the Piltdown race: the very smooth, non-projecting forehead, the very thick bony walls of the skull, the relatively large and convoluted brain, testify to the power of speech and justify Smith Woodward's appellation of "dawn man," the English equivalent of the Greek *Eoanthropus*. Whereas the Trinil race belongs indubitably at the base of the Age of Man, the Piltdown race constitutes a complete distant branch of the human family which occupied Britain either early in the Age of Man or during the close of the Age of Mammals. Thus it is possible that the Piltdown race is of Tertiary Age, like the unknown race which fashioned the flint implements and made the fireplaces of Foxhall in Norfolk, England. The Foxhall race is thus far known only by its flint implements and by its fireplaces, but these are sufficient absolutely to convince the leading anthropologists of France, Breuil and Capitan, that Foxhall man is of Tertiary age, and that its minimum antiquity is more than 500,000 years.

To sum up as to the early branches of the

human family: First, we know the exact age of the Trinil "dawn man" (a far more appropriate designation than "ape-man," since



EXISTING FACTS OF HUMAN ASCENT

1, 2. Dawn stage of human prehistory. 3. First known walking stage, the erect Trinil race of Java. 4. Piltdown race of Sussex. 5, 6. The low-browed Heidelberg-Neanderthal race. 7. Cr6-Magnon and related races of high intelligence. The races 3, 4, 5, 6, 7 are scattered throughout the entire period of the Age of Man, conservatively estimated at 500,000 years. Altogether, upward of 136 skulls and skeletons of the fossil men of this period are known.

his supposed position intermediate between the apes and man has been disproved); we know much of his mental and physical make-

up and that he belongs to an erect-walking race, not to a climbing arboreal race. Second, we know the mental caliber of the Piltdown man. Third, we know the habits and industries of the Foxhall man, although as yet we do not know his brain structure. Fourth, next above this is the Cromer man, who fashioned giant flint implements along the British coast; he too is known only by his industries or works. Fifth, either contemporaneous with the Cromer man or somewhat less ancient is the Heidelberg race, known by the massive jaw, which shows a strong kinship to the jaws attributed to the members of the Neanderthal race. To the unenlightened these documents of Trinil, of Piltdown, of Foxhall, of Cromer, of Heidelberg, are sparse and undecipherable; to the expert who profits by 130 years of laborious research of anatomists and geologists in France, Germany, England, Italy, and Spain, these documents tell a uniformly consistent story.

Absolutely convincing is the new, voluminous evidence regarding the Neanderthal race, which dominated western Europe for a period

estimated as high as 200,000 years. In good preservation are seven skeletons of this race, male and female, found in cavern burials of Le Moustier, La Ferrassie, La Chapelle, La Quina, and Spy, which together afford complete knowledge of every part of the skeleton and of the massive brain; in less perfect preservation are four skeletons of Neanderthal children from the cavern of La Ferrassie. Thus is this race known from eleven skeletons and from less complete remains of nineteen other individuals sufficiently characteristic to be identified positively as neanderthaloid—namely, a child's jaw and teeth from Taubach; jaws and bones of eleven individuals of Krapina, Croatia; lower jaws from Sipka, Marlarnaud, and La Naulette; an historic female skull from Gibraltar; the typical skull and thigh-bone of Neanderthal which gave the name to the race; a child's skull from La Quina. There are also remains of at least eight individuals found at various sites in Britain, Spain, the Channel Islands, and France. Thus altogether our knowledge of the Neanderthal race depends upon the burials

of no less than thirty-eight individuals, often in association with artifacts which are consistently of Mousterian or pre-Mousterian type. This highly characteristic flint industrial phase is the key to the existence of Mousterian and probably neanderthaloid man in the Ordos of northern China, as determined by Licent and Teilhard, and in Mongolia as determined still more recently through the brilliant discoveries of Roy Chapman Andrews and Nels C. Nelson of the American Museum.

The next higher phase of human evolution belonging to the height of the last great glacial age and to the period of sudden retreat of the Scandinavian glacier is that contemporaneous with the Aurignacian, Solutrean, and Magdalenian industries or with the late or Upper Palæolithic age; in this phase we have fifty-two skeletons and portions of other skeletons representing about thirty individuals—eighty-two individuals altogether. Of these, forty-two skeletons belonged to Aurignacian time, including those of Crô-Magnon (which gives the name to the Crô-Magnon race), of Solutré, of Combe-Capelle, all in France; of Enz-

heim in Germany; of Paviland, England; of Grimaldi, Italy; of Brünn and Predmost, Czechoslovakia; of Camargo and Castillo, Spain; of Ojcow, Poland; and of Podkumok, Russia; two skeletons belonged to Solutrean time, one from Laugerie-Haute in France, one from Neu-Essing in Germany; eight skeletons of Magdalenian time are included, six from France (Laugerie-Basse, La Madeleine, Cap-Blanc, Chancelade, Duruthy, Les Hoteaux), and two from Germany (Obercassel), besides remains of sixteen other individuals from Le Placard, Mas d'Azil and Grotte des Hommes, France, Castillo, Spain, and Balla, Hungary.

WE CANNOT EXCOMMUNICATE OUR ANCESTORS

Summing up these irrefutable facts, the case for human evolution rests upon direct and overwhelming evidence. The races of Foxhall and Cromer have left hundreds of humanly fashioned flints on the east coast of Britain; the erect Trinil race of Java and the large-brained Sussex race of Piltdown are revealed through four individuals; the great low-brained Heidelberg-Neanderthal race rests

upon more than fifty individuals; the fine large-brained Crô-Magnon and related races include eighty-two individuals.

We cannot excommunicate these primitive ancestors of ours; whether we will or no we are obliged to welcome them into the great human family.

XI

A NEW BASIS OF CREATIVE EVOLUTION

This is a more or less speculative conclusion to the next previous chapter addressed to the students of Cornell University. The discovery of creative evolution was made by the author not in the sphere of the mind or spirit of man, but in the sphere of the anatomy of lower orders of mammals. The very detailed evidence upon which this discovery rests is now being set forth in two voluminous works for scientific readers. In this chapter the efforts previously made by the Lamarckian and Darwinian schools to account for the origin of the higher mental and spiritual faculties of man are shown to be futile. Most interesting are the successive speculations by able advocates of the Lamarckian and Darwinian hypotheses, especially of August Weismann. There is now strong scientific evidence, derived chiefly from palæontology, that we must revive the idea of creative origins. The new basis of creative evolution discovered in anatomy may be theoretically expanded to the creative evolution of our mental and spiritual faculties.

A NEW BASIS OF CREATIVE EVOLUTION

The known and the unknown in human evolution — Creative evolution a recent discovery — The Lamarck-Spencer theory of the origin of mind abandoned — Creative origin of mental and spiritual traits — Application of Weismann's interpretation of Natural Selection — New traits arising in reaction to racial environment — Hypothesis of coincident selection — Creative origin of musical and artistic talent.

IN his presidential address before the British Association in South Africa, the late Professor Bateson so strongly felt the lack of creative impulse in the word "evolution" that he startled the world by his speculation that all the higher qualities of animal life may have resided potentially in the archaic protoplasm of the single-celled amoeba type.

I do not for a moment share a speculation which Bateson himself threw out somewhat after the quixotic manner of Bernard Shaw's utterances on evolution, but I do feel the inherent weakness in the word "evolution," which signifies to unroll or to unfold, like the unfolding of a book, and the need of the older

Sanskrit $\sqrt{\text{kar}}$, signifying to make or to create; not *creatio ex nihilo* in the one-time theologic sense of creation out of nothing, but in the sense of new forms, qualities, and potencies arising out of pre-existing material.

This is why I am beginning to use the combined words, "creative evolution," and have recently offered a new definition, namely, that *evolution is a continuous creation of life fitted to a continuously changing world.*

THE KNOWN AND THE UNKNOWN IN HUMAN EVOLUTION

In the lay mind the thought at once arises, "Why, this is nothing new; we long since became familiar with it through Bergson's famous work of 1907 bearing these very words for its title."¹ But my honored friend, Henri Bergson, advances on the deductive basis of an internal vital impulse along lines of adaptation, whereas the new basis of creative evolution begins inductively with the prolonged study of physical adaptations and ends in the interpretative generalization expressed in the

¹"L'Évolution Créatrice," Henri Bergson.

words "creative evolution." Bergson advanced from principles to facts; we should advance from facts to principles.

CREATIVE EVOLUTION A RECENT DISCOVERY

Indirect advantages of the fundamentalist attacks that have been made during the past decade upon the whole principle of the evolution of man are the sharpening of our definitions, intensification of our methods of research and broadening of our field of exploration.

As to the sharpening of our definitions, we are more clearly separating what we know and what we do not know about human evolution. In the sphere of absolute knowledge and irrefutable evidence is the anatomical evolution of man. The very brilliancy of the advances along this line, especially during the past three decades, tends to illumine the fact that we have made relatively little progress along moral, intellectual and spiritual lines of human evolution and forces us to realize that the anatomical is, after all, the least human part of the whole process.

The supreme qualities which substantiate the rank that Linnæus accorded man as a primate are not his physical but his spiritual powers, and we are only on the threshold of understanding of the modes by which the spiritual powers of man arose, gained by what we have gleaned of the fossil history of man himself and by comparison with the fossil history of other mammals.

By a natural inversion of the evidence, our rapidly advancing anatomical knowledge certainly helps us on the moral, intellectual, and spiritual side of the problem. If, for example, our anatomical knowledge should lend strong support to the Lamarckian principle of the physical progress of man through the transmission to offspring of adaptations acquired by the parents, this principle might help us to a readier explanation of the origins of moral, intellectual, and spiritual adaptations. In fact, the now broken and discredited crutches of the Lamarckian hypothesis were those on which were built up the speculations of the philosophers Locke, Herbert Spencer, and George Romanes, especially in the latter's

work on "The Origin of the Human Faculty."

THE LAMARCK-SPENCER THEORY OF THE
ORIGIN OF MIND ABANDONED

The most eminent American Lamarckian was Edward Drinker Cope, palæontologist and natural philosopher, who in 1890¹ summarized the origin and evolution of the human mind as follows:

The experiential theory adopted by Locke as a statement of the history of the human mind has been shown by Herbert Spencer to be more correctly an explanation of the development of the mind of animals in general, including that of man. On this hypothesis, while it is admitted that much may be acquired by each individual human mind by experience, it is asserted that more has been acquired by the race in general, and handed down to the existing generations by inheritance. It is further held that the elements of the mind of man were not acquired by him at all, but have been derived by him by inheritance from the pre-existent members of the animal kingdom from whom he is descended. It is the qualities which are thus inherited which appear to the student

¹ "The Evolution of Mind," E. D. Cope, *The American Naturalist*, November, 1890.

who is unacquainted with this explanation of their origin to be spontaneous, or "intuitive" to the human mind. Thus the so-called intuitions of man are shown to be the organized products of the experience of preceding generations.

Perhaps no other anatomist or palæontologist has made a more broad and searching analysis of the Lamarckian hypothesis pro and con than the writer of the present article; this analysis has been based upon literally thousands of observations and measurements among fossil ancestral lines of mammals, not only of primitive and higher primates, but of four diverse and independently evolving kinds of mammals.

Starting in 1888 on the evolution of the primates, after a few months the creative principle was observed; at the time the writer was under the strong Lamarckian reaction of Darwin himself and the Lamarckian propaganda of Cope. Accordingly, these creative origins of new characters were attributed to what may be termed the "experiential hypotheses" of Lamarck, Spencer, and Cope.

During the next two decades, however,

every single observed fact bearing on Lamarckism was severely examined, and the writer was compelled to abandon the "experiential hypothesis" entirely, not only as inadequate but as contrary to the very principle of progressive adaptation which it was designed to explain. This is the negative conclusion as to Lamarckism finally set forth in two great palæontological monographs, encyclopædic in size and scope, now going to press.

CREATIVE ORIGIN OF MENTAL AND SPIRITUAL TRAITS

Obvious is the application to the origin of mind of this newly demonstrated creative principle in the anatomy of the lower animals and in what we know of the anatomy of man. If useful anatomical characters arise without antecedent experience, why may not useful intellectual and spiritual characters also arise without antecedent experience? If the experiential hypothesis is a demonstrated failure in anatomy, why should it not also be proved a demonstrated failure in psychology and in

the origin of our intellectual and spiritual traits?

But we must not advance from the physical to the psychical side of man too hurriedly; we must not too readily assume that the same creative principle prevails in mind as in matter. Moreover, we are endeavoring to distinguish between observed facts and mere hypotheses and to begin entirely afresh, along lines of creative evolution, with open minds and without preconceptions.

APPLICATION OF WEISMANN'S INTERPRETATION OF NATURAL SELECTION

Favoring the possibility of a similar creative rather than experiential origin of spiritual and physical characters is one of the most important biological generalizations of the nineteenth century, namely, Weismann's principle of "the continuity of the germ-plasm," and the series of brilliant discoveries consequent upon this principle in the field of heredity up to the present moment.

The very first corollary of Weismann's principle is that all hereditary characters have a

similar germinal basis throughout the entire animal and plant kingdoms; consequently, by all the accepted principles of heredity, the creative principle must be a phenomenon of heredity. Weismann's application of natural selection to the higher mental faculties is cited below.

Let us, however, first approach the creative problem along an entirely different line, namely, along the line of observed facts of the intellectual and spiritual evolution of man during the prehistoric period beginning with the dawn man of Tertiary times and ending with those dramatic transitions in the intellectual life of man in which, entirely without antecedent experience, he suddenly emerges from Nature, like Minerva from the brain of Jove, fully equipped for supreme intellectual and spiritual tests.

My own reflections along this line were first aroused by the realization of the sudden emergence of the moral, intellectual, and spiritual abilities of the Crô-Magnon race, perhaps 40,000 years ago. An analogous instance is the emergence of the Achæan race of Greece

from the so-called barbarians of the northern forests, a fair-haired race which in a few decades revealed a moral and intellectual supremacy not attained before or since.

Contemporary illustration of the same creative principle is the linguistic, mathematical and artistic ability displayed by youth suddenly transplanted from an uncivilized to a civilized, intellectual environment, entirely without corresponding antecedent experience.

NEW TRAITS ARISING IN REACTION TO RACIAL ENVIRONMENT

It is reflections such as these which led me to declare in the address before the students of Cornell University that the spiritual qualities of man cannot be accounted for by purely evolutionary processes, and that mathematical and artistic faculties of man may be cited as new attributes of the human race, without antecedence in experience, and not to be accounted for by evolution, in the accepted sense of the term.

We accordingly observe that there is an actual parallel between the intellectual and

the physical evolution of man, namely, that in both alike certain characters and qualities arise antecedent to experience. Yet both in mind and in body of man these creative characters adjust themselves to experience; they are adaptive; they fit the environment; they afford adaptive reactions to existing states. Consequently, they cannot be due to a blindly creative impulse, such as the "élan vital" of Bergson, impelling mind and matter into attributes and forms which could be of no possible service because unfitted either to the psychical or the physical environment.

An illustration of this universal quality of fitness to new conditions may be taken from the consideration of the racial evolution of man. I touched on this in my study of the life of John Burroughs,¹ from which I may quote a few passages:

Whence the poet's soul, whence the soul of a race, of a people, of a nation? Have we not reason to believe that there is a racial soul as well as a racial mind, a racial system of morals, a racial anatomy? This is the thought to which I

¹ "The Racial Soul of John Burroughs," H. F. Osborn.

have been led in trying to penetrate to the inner meaning of the life and works of John Burroughs, because, eager as I am about anatomy, I am far more eager about the origin and development of the moral, spiritual, and intellectual nature of man—the mystery of mysteries in biology at the present time. . . .

Our conclusion is that distinctive spiritual and intellectual powers originate along lines of slow racial evolution in climate and surroundings of distinct kinds. In the South were the Mediterranean lines of migration along sunny seas, formidable enough in the winter season, favorable to rapid development of maritime powers, together with artistic powers—the Mycenæans, the Phœnicians, the early Italian races. The Mediterraneans take nature for granted.

In the centre of Europe were the lines of Alpine or Celtic invaders, kept entirely away from the sea, races of agriculturalists and of miners, rich in mechanical talent, neither adventurous nor sea-loving. To the north lived a race of hunters, of seafaring adventurers, resolutely contending with the forces of nature, fond of the open, curious and inquisitive about the causes of things; deliberate in spiritual development, very gradually they reach the greatest intellectual heights and depths. . . .

It is through the reciprocal relation of the inner man and the environing world that there are so few misfits. If Bergson were right, our western

world would be full of disharmonies; we should find Mediterranean geniuses springing up in Scandinavian atmospheres, as is never the case. The racial creative spirit of man always reacts to its own historic racial environment, into the remote past. . . . If Bergson were right, we should have spiritual and intellectual genius appearing out of season and entirely out of accord with environment. . . . Racial aptitudes of the past 20,000 years are now revealed in anatomy and will be no less clearly revealed in the predispositions of morals, of intellect, and of spirit.

Thus we observe a creative rise of intellectual and spiritual characters of which we have no explanation whatever, and side by side with this we place the creative rise of new anatomical characters which are equally difficult to explain. The scientific attitude is to determine whether this creative element in mental evolution is a fact, a principle so universal that it may be called a law. After this point is once settled we may search for explanations.

HYPOTHESIS OF COINCIDENT OR ORGANIC SELECTION

Meanwhile, the only tentative explanation we can offer as a substitute for the "experien-

tial theory" is one which was many years ago proposed simultaneously by the human psychologist, James Mark Baldwin, the comparative psychologist and philosopher, C. Lloyd Morgan, and the present writer. Baldwin used the term "organic selection" and Morgan used the term "coincident selection" with the same significance. Morgan summed up his present views regarding mind in his Gifford Lecture of 1922, entitled "Emergent Evolution,"¹ a metaphysical rather than physical or experimental treatise, in which he does not allude to "coincident selection." Baldwin has not, to our knowledge, applied the principle of "organic selection" to the development of the racial mind, which, like the racial body, is eminently adapted to existing conditions of thought and of life.

In 1896 the writer independently suggested "a mode of evolution requiring neither natural selection nor the inheritance of acquired characters." This is a hypothesis of prolonged or secular inheritance of mental and physical predispositions which happen to coincide with

¹ "Emergent Evolution," C. Lloyd Morgan.

the new demands and habits of life. By this means the individual choice of habit and of habitat, with men as with animals, has been the very pole star of evolution.

This choice of habit or of habitat has sometimes been optional, a matter of pleasure in choosing between two or more alternatives, and sometimes enforced. New habitats also throw all the adaptations to old habitats and habits out of balance and place new mental and physical predispositions at a premium. This Osborn-Baldwin-Morgan process of "organic" or "coincident" adaptation to new mental and physical conditions operates over very long periods of time. Every race of mammal and man thus becomes in a sense creator of its destiny, the architect of its fate.

Take a purely anatomical illustration of organic or coincident selection: By heredity men may be predisposed to arboreal, to cursorial, to terrestrial, or to amphibious life. The born climbers take to the trees, the born swimmers take to the water, the born runners take to the chase. But in turn these very habits of tree life, of aquatic life, of cursorial or running

life, through the process of individual modification and self-adaptation, are self-perfecting.

Those who attain the greatest skill and facility are naturally the most successful members of the tribe. They are the best climbers, the best fishermen, the best hunters. They are rewarded with the first choice of wives and blessed with the first crop of offspring. This is the essence of the principle of organic selection, a subsidiary principle of natural selection.

The illustration I used in 1896 was the following: If a human infant were brought up in the branches of a tree for arboreal instead of for terrestrial life, there is no doubt that all predispositions toward arboreal habit would be retained and cultivated; thus a profoundly different adult type would be produced. . . . During an enormously long period of time in which a race might select an arboreal habitat, such as that selected by the anthropoid apes, it would be possible to accumulate all physical and mental predispositions which favor arboreal life.

CREATIVE ORIGIN OF MUSICAL AND ARTISTIC
TALENT

Weismann very cleverly applied natural selection to the higher mental faculties in the second of his famous essays on heredity (1883)¹:

The sudden and yet wide-spread appearance of a particular talent in correspondence with the general intellectual excitement of a certain epoch points in the same direction. How many poets arose in Germany during the period of sentiment which marked the close of the last century, and how completely all poetic gifts seem to have disappeared during the Thirty Years' War! How numerous were the philosophers that appeared in the epoch which succeeded Kant; while all philosophic talent seemed to have deserted the German nation during the sway of the antagonistic "exact science," with its contempt for speculation.

Wherever academies are founded, there the Schwanthalers, Defreggers and Lenbachs emerge from the masses which had shown no sign of artistic endowment through long periods of time. At the present day there are many men of science who, had they lived at the time of Bürger, Uhland or Schelling, would probably have been poets or philosophers. And the man of science also cannot

¹ "Essays on Heredity," August Weismann.

dispense with that mental disposition directed in a certain course, which we call talent, although the specific part of it may not be so obvious; we may, indeed, go further, and maintain that the physicist and the chemist are characterized by a combination of mental dispositions which differ from those of the botanist and the zoologist. Nevertheless, a man is not born a physicist or a botanist, and in most cases chance alone determines whether his endowments are developed in either direction.

Helpful as are Weismann's examples of the favoring by selection of musical and scientific talents, neither of his explanations really touches the core of the matter of origin, which lies in this newly discovered principle of creative evolution. Once a certain talent originates in man or beast, no one questions the accumulation and strengthening of this talent by Natural Selection; it is the *origin* of the talent which remains to be accounted for. This is why we must search in the new field of creative evolution for the origin of the higher mental faculties of man.

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BORROWER'S NAME

JAN 20 '54

Ordell W. Peterson

OCT 20 '54

Roy Gustafson

NOV 4 '54

Roy Gustafson

OCT 8 '58

Lordon Magnus

JAN 2 '63

Robert L

JAN 16 '63

Robert

FEB 20 '64

Og

MAR 30 '66

P

MAY 11 '6

APR

BL
263
.08

